Pit and Quarry

With which is consolidated CEMENT-MILL & QUARRY

Member Audit Bureau of Circulations

Read in Largest Number of Plants

Vol. XXII April 22, 1931 No. 2

Published bi-weekly on Wednesday for producers and manufacturers of Cement, Crushed Stone, Gypsum, Lime, Sand, Gravel and other non-metallic minerals. Entered as second-class matter October 9, 1928, at the Postoffice at Chicago, Ill., under the Act of March 3, 1879.

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Vol. XXII CHICAGO, APRIL 22, 1931 No. 2

Carloadings Estimate for April-May-June

NON-METALLIC'S OUTLOOK GOOD

A decrease in the carloadings of gravel, sand, stone and cement during April, May and June under the same period of last year is anticipated by shippers' advisory boards which have reported to the American Railway Association. The decrease, however, is not expected to be as great as the decline in loadings of commodities generally. Reports of the boards, which are made up of shippers representing virtually every commodity shipped, on 29 principal commodities, indicate a decrease of 5.8 per cent in carloadings during the second quarter of this year.

The decrease in gravel, sand and stone loadings is expected to be about 3.6 per cent, while loadings of cement are expected to decline about 5.2 per cent. Loadings of gravel, sand and stone during the second quarter of 1930 amounted to about 756,755 cars, whereas the estimated loadings for this year are 729,730 cars. Cement loading is expected to decline from 206,570 cars to 195,874 cars.

Loadings of brick and clay products are expected to drop more than the average for the 29 principal commodities. The figures are expected to decline from 137,839 cars in 1930 to 127,733 cars this year, or 7.3 per cent.

Shipments of lime and plaster also are expected to decrease from 52,450 cars in 1930 to 47,328 cars during April, May and June this year, a decline of 7.2 per cent.

Maxwell Gravel Co. Sold to American Aggregates

Purchase of the Maxwell Gravel Co. of Indianapolis, Ind., by the American Aggregates Corp. was announced recently by C. Gray, manager of the Indianapolis district of the latter concern.

The Maxwell concern, with which Charles S., M. G. and Howard Maxwell have been associated, has released to American Aggregates its two pits along State Road 31, just north of Broad Ripple, an Indianapolis suburb, and across White river, and all its equipment, under terms of the contract.

Equipment in the Maxwell pits will be remodeled and used through the summer, but next fall a new dredge and handling system will be installed, according to Mr. Gray.

Warner Company Leases Florida Gravel Dredge

Warner Co. of Philadelphia has leased the gravel dredge *Magic City* from the Meteor Transport & Trading Co., Miami, Fla., for service on the Delaware River. The dredge, towed by two tugs, was expected to reach Philadelphia late this month. A crew of about 20 men will be required to operate the vessel.

The *Magic City* is 160 ft. long, 50 ft. wide and has a 7-ft. draft. The main power plant is a 500-hp. Diesel engine. Primary and secondary crushing, as well as screening and washing of materials, can be done on board.

Curiously enough, the *Magic City* was designed by Warner engineers in 1926 for the Miami concern. It was built in the Wilmington shipyards of the American Car & Foundry Co.

New Plant Will Operate in Detroit-Toledo Area

C. E. LaBeau, former harbormaster at Toledo, O., is head of the newly organized Monroe Sand & Gravel Co., which is to open a plant at Monroe, Mich.

The concern has leased 1,000 feet of dockage from the Consolidated Paper Co., on the south side of the River Raisin.

The sand and gravel will be dredged from Lake Erie and stored at the shore plant at Monroe for shipment, principally, to Detroit and Toledo.

Michigan Gravel Plant Suffers Damage by Fire

The shop and power house of the Standard Gravel Co. plant located near Milford, Mich., was destroyed by fire recently. The loss was placed at $25,000. Main offices of the company are at Pontiac, Mich.

Iowa Gravel Plant Back on Production Schedule

Production has been resumed at the plant of the Iowa Falls Sand & Gravel Co., Iowa Falls, Ia. New equipment and 3,000 ft. of railroad siding have been installed.

Doubles Capacity at Spring Valley Plant

BUSY SEASON IS ANTICIPATED

In anticipation of one of the busiest seasons in the history of its plant, the Western Sand & Gravel Co. of Spring Valley, Ill., is installing a complete new set of machinery which, when placed in operation late this month, will practically double the output of the plant.

The plant proper is being moved about 500 feet east of the old structure, in order to place the machinery closer to the source of the gravel supply.

For some time past, a force of men under the supervision of Andrew Barrowman, Spring Valley contractor, has been constructing frame work to support the new machinery. All the new equipment was received early this month, and work is being pushed forward as rapidly as possible.

The most important improvement is a new screening and crushing structure with a capacity of 250 tons of gravel per hour. This is practically twice the capacity of the former structure. Two new double-deck vibrating screens and five belt conveyors are being placed in operation. The conveyor belts will carry the gravel from a field hopper to the crusher.

In addition to stepping up the efficiency and capacity of the plant the new machinery will offer a wider range of sizes and give the company a better variety in competitive bidding with other firms.

During the summer months two shifts of men are to be employed and the plant kept in continuous operation night and day, according to present plans. On an average about six or seven men are employed in each shift.

U. S. Will Probe Soviet Asbestos Importations

The United States Tariff Commission has ordered an investigation of the sale and importation of Russian asbestos as a result of charge of unfair practices made by the Bear Canyon Asbestos Co., of Ambler, Pa., and the Regal Asbestos Mines, Inc., of New York, N. Y. This is the first investigation under Section 337 of the 1930 tariff act.

Lee S. Trainor Joins Staff of Lime Assn.

TO PROMOTE STRUCTURAL USES

Lee S. Trainor, prominent in the engineering, construction and cement fields, has been appointed chief engineer of the construction division, National Lime Assn. He will have his headquarters at the general offices of the association at Washington, D. C.

L. S. Trainor.

Mr. Trainor began his engineering career in 1904 with the Burlington Railroad, progressing from his first job as rodman to assistant engineer. In 1911, he left the railroad to become city engineer of Centralia, Ill. From 1913 to 1919, he was county superintendent of highways of Marion County, Ill.

In 1919, Mr. Trainor joined the Portland Cement Assn., where he remained for a decade. His first three years were spent as field engineer in the Southern Illinois area. For the next five years, he was district engineer in charge of the Chicago territory, supervising the association's promotional activities in the entire state of Illinois. In 1927, he was promoted to manager of the highways and municipal bureau.

During 1929 and 1930, Mr. Trainor was district manager for McEverlast, Inc., having charge of the Chicago branch office territory.

Mr. Trainor is possessed of a keen engineering mind and a magnetic personality. His wide experience and executive ability are certain to be reflected in his future efforts in furthering the use of lime and the services of the lime industry to the American construction industry.

Chicago Producer Puts Barge Line in Service

The Material Service Corp. of Chicago has placed its river barge *Material Service* in operation between its storage yards at Chicago and its plant at Lockport, Ill. More than a half million cubic yards of crushed stone will be produced and shipped this season, it is estimated.

Iowa Concrete-Products Concern Names Officers

The Concrete Products Co., of Cedar Rapids, Ia., at its recent annual meeting elected the following officers: F. M. Popenhagen, re-elected president; D. I. Roland, re-elected secretary and treasurer; W. L. Stepanek elected to board of directors.

Hartford Talc Company Constructs Quartz Plant

The Hartford Talc Co., Inc., of Baltimore, Md., has completed the construction of a plant for the production of white quartz. The plant is located at the deposit near the town of Dublin.

Cement Sales Director in Gubernatorial Race

Andrew O. Ritchie of Lexington, Ky., sales representative in Kentucky for the Southwestern Portland Cement Co., has announced his candidacy for the nomination for governor on the Republican ticket.

Steel Company Awarded Cement-Plant Contract

The Missouri Portland Cement Co., St. Louis, Mo., has awarded a contract to the Havens Structural Steel Co., Kansas City, Mo., for extensions and improvements at its plant at Cement City, a St. Louis suburb, to cost over $75,000 with equipment.

Omaha Cement-Products Firm Installs Equipment

The Hydraulic Co. of Omaha, Neb., recently added conveyors for unloading materials from cars to its plant, and new steaming ovens, the new equipment costing about $4,000. The company is manufacturing concrete blocks.

Yosemite Cement Plant at Merced Begins Work

The Yosemite Portland Cement Co., San Francisco Cal., recently resumed operations at its Merced, Cal., plant which suspended operations about three months ago. The company will also open its quarry at Emory, Cal., shortly.

Mining Students Visit Superior Cement Plant

Members of two mining classes at the University of Washington, Seattle, were guests of Superior Portland Cement, Inc., at its plant at Concrete, Wash., on March 25. The students visited the plant and quarry as part of their annual spring field trip.

Florida Lime Operator Makes Soil Conditioner

A new lime-manganese soil conditioner is being manufactured by the Dixie Lime Products Co. of Ocala, Fla. The product is being marketed under the trade-name of "Liman."

More than $100,000 is being spent by the Youghiogheny Crushed Stone Co. of Connellsville, Pa., at its Casparis plant to modernize the equipment and permit increased production with lower operating costs.

Cast-Stone Institute to Meet in Cleveland

EVERY MANUFACTURER INVITED

An announcement of interest to all cast-stone manufacturers is that the annual convention of the Cast Stone Institute will be held in Cleveland, May 11 and 12, at the Hotel Cleveland. Every cast-stone manufacturer who is interested in the future of the industry is urged to attend, whether his company is a member of the institute or not.

Never in its history have the problems facing the cast-stone industry been of greater interest and more importance than at present. Neither has the industry ever had better means at its disposal for meeting its problems than are now offered in the Cast Stone Institute. The Institute's third annual report, to be presented at the Cleveland convention, will show that considerable progress has been made during the past year in establishing wider recognition for standards of quality in cast stone, in arousing greater interest among manufacturers in improving their product, and in demonstrating the effectiveness of coöperative action in solving the problems of the industry.

It is felt that the convention program will be of unusual interest to cast stone manufacturers. P. H. Bates, of the United States Bureau of Standards, will discuss research as it is applied to concrete. He will explain the fundamental principles upon which scientific research is based, and he will also explain the interpretation and application of the results of research. C. H. Randolph, of the Minnesota Mining & Manufacturing Co., will explain and demonstrate some recent developments in stone-finishing methods and equipment which are rapidly revolutionizing the granite, marble and stone industries and which offer exceptional opportunities to cast stone manufacturers. A comprehensive report will be made by C. G. Walker, assistant secretary, on the status of cast stone in government building and the prospects for a more extensive use of it in such work. A number of other interesting papers are also on the program.

Information as to hotel accommodations and railroad rates can be obtained from the assistant secretary of the institute at 33 West Grand Ave., Chicago.

Winterset Limestone Co. Erects Crushing Plant

The Winterset Limestone Co. of Winterset, Ia., is erecting a crushed-stone plant near that city to supply 40,000 tons of stone for road-paving purposes. Glenn Poarch of Kingsport, Tenn., former quarryman for the Pennsylvania-Dixie Cement Corp., and Alfred Danforth are the owners.

Milwaukee Producers to Stabilize Prices

ADOPT RIGID CODE OF ETHICS

Wisconsin's coöperative marketing law has been invoked by Milwaukee sand and gravel dealers in an effort to stabilize the market and establish fair trade practices. Dealers and producers, operating under the name of the Sand and Gravel Coöperative Association of Milwaukee County, recently organized, are now functioning according to Otto Lutz, president.

As explained by Mr. Lutz and other sand and gravel operators to the *Milwaukee Journal*, the need of a cooperative association was felt to be imperative after the disastrous 1930 season. Competition brought on price cutting on such a wide scale that all producers had losses.

Between 25 and 35 dealers have signified their intentions of joining the coöperative. They have drafted a code of ethics, defining fair trade practices, and have filed their rules with the Wisconsin department of agriculture and marketing, which sponsored the movement.

The code establishes a uniform price for all sand and gravel products and is just as binding upon independents as it is upon the members of the coöperative. Any attempt to cut prices below the minimum fixed by the association will be reported to the state and, if necessary, orders to desist will be issued. Refusal will result in action to enjoin the independent or organization member who refuses to abide by the code.

As the result of the coöperative move, 1931 prices for sand, gravel and crushed stone will be advanced between 20 and 35 cents a cubic yard over the competitive prices of last year, but they will be $1 or more lower than schedules fixed two years ago when the Wisconsin Mineral Aggregate association still existed.

"If any sand and gravel dealers refuse to join the coöperative we cannot force them to do so," one member of the association recently declared. "Each member's books will be subject to audit by the association, and independents, if they are reported to have violated the code, will be subject to scrutiny by auditors of the Wisconsin department of agriculture and marketing."

Under the code each member will manage his own business as formerly, bid on furnishing materials to building contractors and deliver the products as he always has done. He will be permitted to sell higher than the minimum price, but not lower.

One plant operator predicted that one of the results of the coöperative system will be better pay for workers at gravel pits and independent truckers who haul the commodity to jobs.

"Stability of the market will assure us of a fair profit where competition not only cut the profits but left all of us in the red last season," he said. "A share of the profits will be passed on to our employees."

The officers of the association are Otto Lutz, president; Louis Garrity, vice-president; A. A. Retzlaff, secretary, and Henry Jaeger, treasurer. The board of directors includes all of the officers and W. Palmer, Hartland, Wis.; Walter Hartung, Herman C. Luedke, Bruno Kaestner and A. W. De Vos.

Cincinnati Gravel Man Fatally Hurt in Crash

Byron T. Van Camp, president of the Van Camp Sand & Gravel Co. of Cincinnati, O., was fatally injured March 28 when the car he was driving crashed into another on the National Highway near the village of Eaton, O. Mr. Van Camp sustained a fractured skull and died in a hospital at Richmond, Ind., where he was taken after the accident. Ralph Van Camp, 22, a son, was also injured, though not critically, and was confined to the hospital where his father died, for some time.

B. T. Van Camp.

Mr. Van Camp was 42 years old and had been active in the operation of his company since its organization. The Van Camp Sand & Gravel Co. also produces crushed stone. The plant is located at South Lebanon, O.

Southern Gravel Co. to Start Operations Soon

The Southern Gravel Co., which purchased the plant and holdings of the Southern Sand & Gravel Co., located on the Atlantic and Western Railway company line, 20 miles east of Sanford, N. C., will begin operations before the first of May, according to reports. Junius H. Harden, of Burlington, N. C., is president, and E. L. Henderson, also of Burlington, secretary and treasurer of the company. Mr. Henderson will be in active charge.

Capacity Production at Tennessee Shale Plant

The Kingsport, Tenn., plant of the General Shale Products Co. has resumed operations after being shut down for several months. The plant is running at capacity, according to reports.

Buys California Pumice Deposit; to Erect Plant

The Celotex Co. has purchased the Red Island pumice deposit southeast of Salton Sea, near El Centro, Cal., and plans the erection of a plant.

Cement Committee to Increase Activities

TO ADD TECHNICAL ASSISTANT

At a recent meeting in New York, Committee C-1 on Cement of the American Society for Testing Materials took another forward step in improving its efficiency of operation and its service to cement users. While the committee is a large one and composed of representatives of nearly all important technical groups who use or make Portland cement, the committee recognizes that this material is so widely used and its uses are so diversified that it is almost impossible to keep in touch with the views and experiences of cement users through its membership. The committee, therefore, has suggested to the Society for approval the plan of employing a technical assistant to the chairman of the committee, whose duty, among others, would be to keep in touch with developments in cement and concrete in the different fields of its use.

Through its long history as a specification-making committee, the committee on Cement has developed and improved from time to time numerous methods of tests for cement. More recently it has established, through a fellowship arrangement of the U. S. Dept. of Commerce, the Cement Reference Laboratory, which is located at the National Bureau of Standards, Washington, D. C. The Reference Laboratory is available to all who desire to use it as a means of checking the methods of making tests on cement, the apparatus used in making the tests, and the technique of laboratory practice.

There has been found a considerably increased interest in the questions of what should be the requisite properties for masonry cements and what methods of tests should be employed for such materials. These questions are being actively studied by the committee and there should soon be sufficient data available to enable the committee to offer a specification for masonry cements.

Argentina Granite Men Form Trade Association

The Asociacion Productores de Granito, Union Industrial Argentina has been organized to afford the quarry operators of the Argentine such advantages as attend membership in similar national organizations in this country. Headquarters have been established at 1157 Avenida de Mayo, Buenos Aires, and the president would appreciate correspondence from American operators of quarries and manufacturers of quarrying equipment.

The plant of the Consolidated Cement Corporation at Cement City, Mich., has resumed operations with about 100 men back on the pay roll.

Water Frontage Sold to Michigan Operator

LOADING PLANT ESTABLISHED

The Tom Johnson Gravel Co., of Grand Haven, Mich., has acquired 132 feet of water frontage at Ferrysburg, Mich., to accommodate additional business during the coming year. A dock is being built along the frontage where scows from the dredging deposit in the Bass river may be unloaded and the gravel shipped to northern points.

In addition to its new holdings at Ferrysburg, the Tom Johnson Gravel Co. will continue to operate its plant in Grand Haven, where a new screening plant was installed during the winter. Dredging of gravel started early in April. The company operates nine scows and a tug, the *Senniece* and, for water shipments on Lake Michigan, will charter the gravel carrier *Fred W. Green.*

Last year the output of gravel by this concern was 75,000 tons and 15 men were employed by the company. The Tom Johnson Gravel Co. is a partnership owned by Tom Johnson and Capt. Duncan McDonald. Both are pioneers in the gravel business, Mr. Johnson having formerly been associated with Capt. Isaac Van Weelden. The present firm was formed in 1921.

New California Company Buys Limestone Deposit

The California Lime Product Co. has purchased limestone deposits comprising 145 acres, on the main line of the Southern Pacific Co. near Towle, Cal., for a reported consideration of $125,000.

According to R. E. Mittelstaedt, president of the company, the deposits constitute the largest and most accessible in the state.

Work of opening the quarry will start at once. The company will also shortly begin the erection of its agricultural lime, chicken grits and other lime products at a plant to be located near Sacramento.

The principal offices of the company are in Sacramento, with sales offices in San Francisco.

Film Visualizes Modern Manufacture of Cement

The making of Portland cement is visualized in a new one-reel educational motion picture entitled, "From Mountain to Cement Sack," prepared by the U. S. Bureau of Mines in coöperation with an industrial concern. The use of animated drawings and ingenious photographic methods make it possible to show clearly the highly-complicated processes employed in its manufacture.

Copies of the film may be obtained for exhibition purposes by schools, clubs, churches, civic and business organizations, and others interested, by applying to the Experiment Station of the U. S. Bureau of Mines, Pittsburgh, Pa. No charge is made for the use of the film, but the exhibitor is asked to pay transportation charges.

Claude Lutzka, Earl Staley, Hilbert Anderson and Ray S. Huey, Supt., celebrating light snowfall with a croquet game.

Journalist Takes Post With Asbestos-Talc Co.

J. H. Forman, former newspaperman, has accepted a position as sales manager of the Asbestos Talc Products Co. of Burlington, Wash.

The company's asbestos mine began producing last September. Work was resumed April 1 after a three-month layoff for repairs.

Dr. W. L. Jackson of Burlington is president of the company and C. R. Buck of Mt. Vernon, Wash., is secretary-treasurer.

New Thunder Bay Plant to be Ready by Autumn

Operations at the new plant and quarry of the Thunder Bay Quarries Co. near Alpena, Mich., are being pushed in an effort to start production by August 1, 1931. One of the largest units remaining to be built is the shipping dock to be located on the shore of Thunder Bay, south of the plant of the Huron Portland Cement Co.

The company owns 2,000 acres of limestone deposits at the new quarry and plant site.

Reduced Freight Rates on Gravel in Wisconsin

Reduced rates on the hauling of sand and gravel from nearby Wisconsin producing centers to Milwaukee by railroad lines of the state became effective April 7. The railroads affected are the Milwaukee road, the Chicago and Northwestern road, and the Soo line. The new rates, approximately 25 per cent less than the old ones, were granted by the Wisconsin railroad commission at the request of the rail lines.

Croquet Enthusiasts at Duluth Play All Winter

The warmest winter at Duluth since 1882 has permitted a croquet game on the lawn of the Universal Atlas Cement Co.'s Duluth plant practically every day since Thanksgiving, on a court that winter usually buries in two feet of snow, according to Ray S. Huey, superintendent.

Twice during the winter Mr. Huey and his rivals at this new northern sport of "snowquet" missed their lunch-hour game on account of four-inch snowfalls, but once they continued at 15 below zero. "Playing in two inches of snow," he says, "is like playing in summer when the grass is high."

Other veterans of this wild northern winter of wickets are Martin Lindquist, mill foreman; A. E. Miller, packing and loading foreman; A. S. Hetherington, employment and safety director; Earl Staley and Hilbert Anderson, billing clerks; and Claude Lutzka, shipping clerk.

Before becoming manager of the Duluth mill in 1916, Mr. Huey, a graduate of the Armour Institute of Technology, had designed and erected one of the power stations of the Buffington, Ind., plant of the present Universal Atlas company, and had still earlier worked in Saginaw, Mich., Cleveland, O., and Inyo County, Cal.

Acquires Michigan Salt Property at Marine City

J. S. Goldman, of the United Iron & Metal Co., is reported to have completed negotiations for the purchase of the Michigan Salt Co. properties located on the St. Clair river, south of Marine City, Mich.

San Francisco Concrete Plant in New Location

The Readymix Concrete Co., of 475 Berry street, San Francisco, Cal., has moved its plant to the corner of Carolina and Mariposa streets.

Asbestos Production in Quebec Decreases

MINES UNDERGO IMPROVEMENT

For the first time in history, asbestos has been displaced as the leading mineral product of the province of Quebec. Its $5,000,000 drop in production, compared with previous year, permitted copper, which showed an increase of $406,000 in output, to assume first place, figures for 1930 by the Quebec Bureau of Mines show.

Production of asbestos in 1930 was 242,112 tons, valued at $8,390,163. This is a decrease of 63,943 tons in quantity, and of $4,782,418 in value, compared with 1929. Quebec asbestos had to bear competition of increasing production of southern Africa, and more particularly of the long fibre grades of Russian asbestos. In commenting on Russian asbestos production, the official report states that it is produced practically by conscripted labor and "the contest for markets at large really amounts to dumping, owing to a campaign of price cutting.

"All the Quebec asbestos mines have had to curtail their operations considerably, and several of the mines have been closed down. Asbestos Corp., Ltd., has probably felt the adverse effects more than the others. This company is taking advantage of this quiet period to change the methods of mining at the King mine at Thetford, from open pits to underground. A great deal of drifting, cross-cutting and shaft-sinking was done in 1930 and, at an early date, practically all the mining will be done by underground methods, which will permit of going down much deeper than by open pitting. A feature of this new development at the King mine is that no timber is being used. All props, sets and supports are of steel, one of the objects in this being to avoid presence of any wood fibre to contaminate the asbestos fibre."

Statistics show that the average value per ton of crude No. 1 asbestos during 1930 was $480.44, compared with $557.38 during 1929, while for an average of $285.44 last year, against $331.82 during the previous 12 crude No. 2, the next best grade, sold months.

Stocks on hand at the end of last December were higher than the previous year, being $3,404,444 and $2,-465,337, respectively.

New York Gypsum Mines Install New Equipment

New equipment is being installed in the mine at Clarence Center, N. Y., of the National Gypsum Co. With the addition of a Westinghouse 100-kw., synchronous motor-generator set, a Baldwin-Westinghouse 8-ton, two-motor, trolley-type locomotive, and the necessary line equipment, this mine becomes completely motorized.

The motor-generator set has semi-automatic control and arrangement has been made for a duplicate set with equalizers. The locomotive operates on 250-volt direct current, with series-parallel control and dynamic braking. An independent motor-driven conductor reel may be added later to the locomotive.

The mine's productive capacity will be increased by these additions.

Michigan Sand Company Installs New Equipment

The Cass City Sand & Gravel Co., Cass City, Mich., is putting its plant in readiness for the season's business. A new ball mill for pulverizing rock has been installed.

At the annual meeting of the company, the following officers were elected: president, J. A. Caldwell; vice-president, E. B. Schwaderer; secretary-treasurer, Ernest Schwaderer.

Quarrymen at St. Louis Take First-Aid Course

A five-weeks' course in first-aid training is being given by the U. S. Bureau of Mines to the employees and officers of the member companies of the St. Louis Quarrymen's Assn. One of the Bureau's headquarters cars is spotted on a track at the Rock Hill plant of the Rock Hill Quarries Co., St. Louis. This car is one of several that are maintained for both first-aid instruction and for despatch to sites of mine or industrial disasters. It contains an office, sleeping accommodations, dining room, and complete resuscitation and first-aid apparatus. This particular car is in charge of E. E. Quenon.

Classes are being held once a week at six different quarries. The hours are from three to five o'clock in the afternoon, and the companies insist upon 100-per cent attendance by the employees who receive pay for the time. Upon completion of each course the government experts award certificates to those men who prove their competence for responsible duties about the plants and quarries at times of accident or disaster.

This training is available, without expense, to operators anywhere within the United States. The officers of the St. Louis district quarries are enthusiastic over the instruction.

Lone Star Indiana Back on Production Schedule

Operation at full capacity was resumed April 1 at the Lone Star Cement Co. plant at Limedale, Ind.

The cement plant has contracted with the Indiana State Highway Commission to furnish, during the next few months, 650,000 barrels of regular cement and 20,000 barrels of quick-setting cement.

New River Terminal to Assist Shippers

HAS RAIL, TRUCK FACILITIES

Important savings in distribution, transportation, and storage costs to manufacturers and shippers of building materials, tile, brick, cement, and other products in the Middle West, will be made possible with the recent opening of the new $500,000 Mead Johnson water-rail-truck terminal in Evansville, Ind., on the Ohio river.

The new terminal, which has a capacity for handling 1,000,000 tons of freight yearly, is expected to write history in the development of waterways transportation. It provides facilities for handling railroad-freight and motor-truck shipments via barge to points up and down the Ohio and Mississippi rivers, the Gulf of Mexico, and to the ports of the world. The opening of the new terminal, in effect, makes Evansville one of America's most inland seaports. Low haulage cost by water to and from Evansville will be available to shippers of practically every commercial commodity.

Every railroad entering Evansville will be able to discharge freight at the Mead Johnson terminal for loading on barges for water haul. The tracks of two lines, the Chicago & Eastern Illinois and the Louisville & Nashville railroads, pass through the terminal and provide reciprocal switching arrangements for freight moving on the Illinois Central, the Big Four, the Evansville, Indianapolis & Terre Haute, and the Southern Railway System all of which serve Evansville. Motor-truck lines for hundreds of miles around Evansville will be able to haul freight to or from the terminal for transfer to or from water.

Gravel Plant Under Way Near Clitherall, Minn.

The Becker County Sand & Gravel Co. has leased a tract near Clitherall, Minn., and has begun the construction of a screening, crushing and washing plant. E. A. Mullen, of Detroit Lakes, Minn., is the general manager, and is superintending the installation work.

Old Workmen of Cement Company Awarded Medals

The Northwestern States Portland Cement Co., Mason City, Ia., recently gave a banquet to 300 employees, presenting gold medals to those who have been with the company for twenty years or more, and silver medals to those being with them for ten years of service.

The Lawrence Portland Cement Co. has moved its New York sales office from 302 Broadway to 270 Broadway, opposite City Hall Park.

Editorials

Improve—But Don't Expand

NOW that business shows unmistakable signs of continuing improvement, overambitious producers are reviving old expansion plans which had temporarily been laid aside during the pinching months that have passed. As long as business was what the average man called "poor" his attention was too closely focused on the problem of finding work for his partially idle plant to think much of expansion. His attempt to maintain prices on a profitable basis in spite of severe and price-cutting competition, to keep organization intact in the face of continually declining output, to spread production evenly throughout the year so as to avoid shutdowns, and to keep equipment up to par, called for the exercise of enough ingenuity and concentrated thinking to occupy his time. If he had any surplus either of time or of mental energy, there were the problems of keeping wages at their old levels in order not to reduce the worker's buying power, of revamping production methods in the interest of lower production costs, of devising new selling policies, and the like. But as for expansion, only rash men indeed thought of adding to facilities that were already more than adequate to handle business at its peak.

Yet, business has barely given the first encouraging signs of recovery and producers are already vying with one another in planning for larger plants and additional plants, foolishly believing that, in the period of prosperity that is to come, there will be a dearth of production capacity and that it will be the part of wisdom to prepare now. One might think that the period just closing had shown in no uncertain way the absurdity of adding further to the production facilities of an industry whose production capacity has never been overtaxed, and that the disappointments and failures of the recent past would have left a little of the restraining force of caution in the minds of the survivors. The times have certainly shown the need for caution, yet "great expectations" continue to breed in a soil that, in view of experience, should be anything but fertile. A burned child, it is said, fears the fire. Should not as much be expected of the "burned" business man?

We see nothing in the business outlook to justify plant expansion. Of course, there are special cases in which enlargement is justified, but the great difficulty is that every producer believes his case is one of the special cases, and that, on this theory, plans for expansion proceed unchecked. Each producer seems to think that in the period to come he will be able, by some cunningly devised plan, to outmaneuver his competitor, to gain some tactical advantage, which will obtain for him the lion's share of the business in his territory. Price concessions, special credit discounts, overshipping, skimping on specifications, bribery—these are the methods usually relied on as means for alienating business from a competitor. Already committed to a policy of wastefulness in production, through having made unwarranted additions to production capacity, the overexpanded producer is driven to adopt a similar standard of wastefulness in other departments of his business. He may think the expedient only a temporary one, but his adoption of it incurs retaliation on the part of his competitors, until, finally, what was only a rash exception becomes the rule, and all business is demoralized.

Expansion is in the air, now that some of the tenseness of the past year has been relieved. Reports of proposed expansion reach us in increasing numbers, although, as far as we know from investigation in numerous cases, no expansion is justified in the majority of instances with which we are familiar. We are frequently asked for our opinion on the advisability of making certain proposed changes—usually for the purpose of increasing production facilities—and in almost every instance where we have made the study necessary for the forming of an intelligent opinion we have discovered that the producer involved has been misled by some unexpected upward turn in business which temporarily overloaded his plant, or that he cherishes the foolish hope of being able in some mysterious manner to invade the territory of better equipped competitors and, by the adoption of no more practical methods than some of the expedients already named, to gain control of wider markets.

In our opinion, the producer who plans on improvement, rather than expansion, of his existing facilities is steering a wise course. Business of the future—immediate as well as distant—will be won less and less on the tricks of price-cutting and more and more on the basis of genuine values, among which the quality of the product and the stability and dependability of the producer will be prominent factors. Quality can be counted on to assume an ever-increasing importance in the business of the future. Buyers are learning that price is but one of many elements in a profitable purchase, that permanence of investment, whether in highway, residence, or commercial structure, is a consideration of much greater importance. The increasing rigidity of specifications from architects and highway engineers, in spite of their irregularities and striking differences, indicate a search for a higher degree of suitability in the materials of construction than has been demanded in the past.

Although we like to think of the non-metallic mineral industries as good examples of efficient pro-

duction, the fact remains that efficiency in our industries is a term for individual and not general application. This is true of the most technical and most highly mechanized branches of these industries, such as cement and gypsum, as well as of the less technical branches, such as sand and gravel and crushed stone. There is undoubtedly a difference between the two extremes, but the difference is one of degree. The cement industry, which boasts the use of some of the most advanced methods and equipment, is still burdened with many obsolete plants, whose inferior product, offered at very low prices, is brought into competition with the superior and more expensive product of modern plants.

Equipment manufacturers are offering machinery that, in theory and in practical results, is far in advance of the state of mind of the industry for which it has been designed. There are few plants in any branch of our industries that could not be greatly improved—in fuel rate or power consumption, in production-labor cost, in repair and maintenance cost, in quality and uniformity of product—by the introduction of more efficient equipment, either through adding new and more modern machinery for certain processes or through the partial or complete redesigning of existing facilities. In cement plants, for example, the great advantages of slurry filtration are just beginning to be understood, largely because the advantages to be obtained are so far beyond the conception of the average cement producer. Although the introduction of efficient filters has, in some cases, reduced the fuel rate to less than that found in some "efficient" dry-process plants, long-time familiarity with their old methods has made it virtually impossible for some dry-process operators to credit the claims of filtration advocates. In other branches of our industries equal opportunities await the forward-looking producer. Modern crushing and screening equipment has established entirely new standards of efficiency; the great advantages of closed-circuit grinding are unbelievable to many who have not installed modern equipment; the best modern hydrating equipment is upsetting all time-worn notions regarding the uniformity and quality of hydrated lime.

The great need of the non-metallic mineral industries is greater efficiency, not greater output. There is no present market for a greater output than these industries can supply with existing equipment, and there is no good reason to suppose that there will be for several years. But there is a market for products of better quality and greater uniformity—for all, perhaps, that these industries are equipped to furnish—and this market will grow as the knowledge of building-material characteristics and performance increases. The requirements of the buyer are certain to become more exacting as to quality and less exacting as to quantity, because, as increasing quality results in longer life, the demand for replacement materials may be expected to show a relative decline. Such a change will undoubtedly place a premium on the products of the most efficient plants, at the same time that it rejects the products of the less efficient plants.

When buyers' requirements change, producers must change their products to meet those requirements. This is axiomatic; and, in course of time, the change is always made. But the producer who is able to anticipate these changes in buyers' demands and, what is just as important, is able to install the equipment for efficiently producing the more marketable product, is the one who can count most surely on a permanent success. Leading the procession, he can more easily remain ahead of the followers.

Every period of slack business teaches a lesson, but too often the moral goes unheeded. More than any of its predecessors, the last slump in business has shown the frightful cost of overexpansion and overproduction. For all those who have eyes to see and money to spend, the lesson is clear: "Improve, but don't enlarge; expend but don't expand."

Gasoline Taxes and Roads

MOTOR-VEHICLE owners are paying more each year for the privilege of operating their machines on the public highways, largely because of the propaganda carried on by the railroads in favor of higher gasoline taxes and registration fees. Although the price of gasoline has decreased 48.8 per cent. during the last ten years, the average gasoline tax has increased 2,657 per cent., according to the results of a recent survey. This investigation shows that the average retail price of gasoline on March 1 of this year was 14.46 cents a gallon, a decline of 13.79 cents from the high price of 28.25 cents in effect March 1, 1921. Gasoline taxes now average 3.86 cents a gallon, although they were only .0014 cent ten years ago, the increase being due partly to the fact that gasoline taxes are now higher than they were then, but chiefly to the fact that, while only sixteen states levied a gasoline tax at that time, such a toll is now imposed in every state and the District of Columbia.

The gasoline tax was adopted on the principle that it was the most equitable method of proportioning taxation to the use made of the highways, and the promise was generally made that the income from this source would be used for highway improvement. Relying on the promise, motor-vehicle owners accepted the principle, but recent experience has shown that increasingly large shares of gasoline taxes collected are being diverted to other purposes. Highway users, as well as the suppliers of highway materials, are not receiving the benefits to which they are entitled. Unless gasoline taxes are applied solely to road building and road improvement, in accordance with the only theory that will justify the levying of them, motor-vehicle owners and road-material producers may reasonably demand either their reduction or their abolition.

Aërial view of operations. Pulverized-rock plant at lower left; crushed-stone plant and quarry, center; and lime plant, upper right.

Quarries and Produces Wide Variety of Non-Metallic Mineral Products

Wisconsin Operations Form One of Most Extensive Plant Groups in Middle West

By MAT F. BEISBER

MOTORISTS driving along Highway No. 164 in Wisconsin between Waukesha and Menominee Falls have occasion to see one of the greatest non-metallic mineral production plants in the Middlewest. Spread out on both sides of the highway for nearly a mile from the northerly limits of the city of Waukesha, this plant comprises a complete sand-and-gravel plant, a crushed-stone plant, a pulverized-rock plant, a 5-kiln lime plant and a limestone quarry. Located on this company's property are also a complete ready-mixed concrete plant and a patented-process paving-materials plant.

The group of industries owned by the Waukesha Lime & Stone Co. is probably the only one of its kind in the Middlewest wherein sand and gravel, crushed stone, pulverized stone, dimension stone, and kindred products are produced—all by the same company under the same management.

The sand-and-gravel deposit, located to the east of the highway, is a 90-ft. bank of excellent gravel overlying a limestone deposit estimated to be 500 ft. in depth. This unusual condition provides an almost inexhaustible supply of raw material for, whenever desired, the underlying rock deposit will furnish the finest grade of stone in unlimited quantities. For the present, the stone quarry on the west side of the highway furnishes all the raw material for the crushed-stone and the pulverized-rock plants, as this supply is plentiful with but a light layer of overburden. This deposit is unusual in that it includes hard limestone, building stone and agstone.

The early history of the company reveals that the Waukesha Lime & Stone Co. was one of the pioneer construction-materials companies of the state. Organized in March, 1905, by John O'Laughlin, the company began its career as a stone quarry and a lime-kiln plant. In 1910, the sand-and-gravel plant was added, and to this plant Mr. O'Laughlin contributed many of his own inventions and improvements. The rotary washing-and-classifying screens, still in use, are of his own design and patents were granted to him for their invention. This type of screen received wide recognition, and continues to be manufactured in Chicago by the Johnston-Chapman Co. In 1913, Mr. O'Laughlin died, after which the estate carried on the business. The present officers are: Mrs. M. O'Laughlin Gillen, president; Fred C. Wolf, vice-president; Norman K. Wilson, vice-president and sales manager; Elmer F. Bremer, secretary and treasurer.

In 1914, the pulverized-rock plant was built, and,

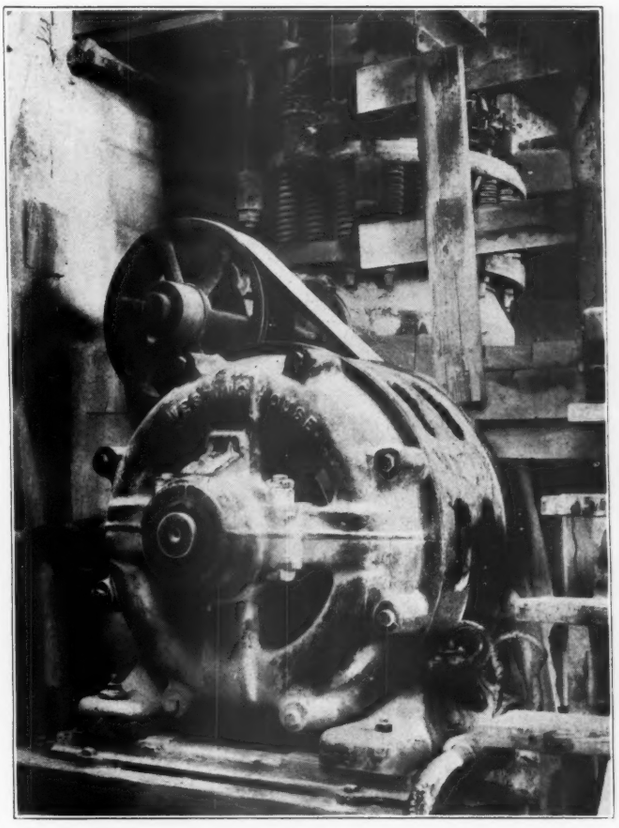
since 1918, the production of lime has been discontinued, the plant having been leased to Payne & Dolan, Inc., manufacturers of paving materials. Crushed stone, purchased from the Waukesha company, is processed in the former lime plant, the kilns being used now as coolers.

Another outlet for a considerable quantity of aggregates is through the Cayll & Barrett Co. ready-mixed concrete plant which is located on the Waukesha company property to the south of the sand-and-gravel plant. The Cayll & Barrett Co. has access to the stock-piles of the gravel plant by means of a tunnel-conveyor system. An article entitled "Finds Small City Offers Big Opportunity in Ready Mixed Concrete Field" was published in the October 22, 1930, issue of PIT AND QUARRY, describing this plant and its processes.

The remarkable growth of the Waukesha Lime & Stone Co. is reflected in a comparison of its financial position at the time of its organization and its present statement. In 1905, the company was incorporated with a capital stock of $50,000. The present capital stock is valued at $522,000 and according to an American Appraisal Co. report, the reproductive cost of the plants and equipment is $1,000,262.25 as of June 30, 1930. The present property includes a total of 283.47 acres, which, with the plants and equipment, makes this company one of the largest in the West.

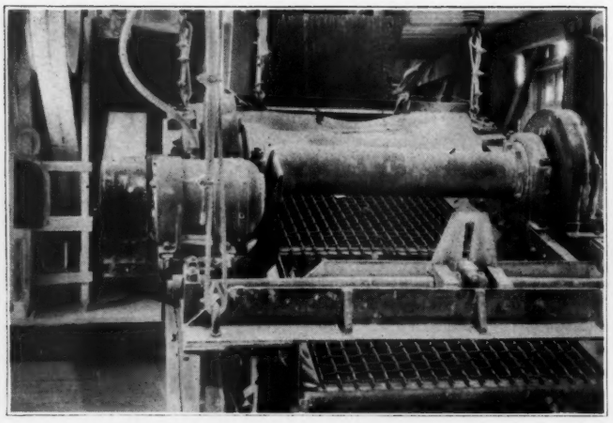
Crushed stone and pulverized rock are produced in the two plants located on the west side of the Highway No. 164. Raw material for the crushed stone plant is produced in a quarry adjoining the plant to the west. This quarry extends from the city limits of Waukesha to the junction of Highway No. 30 on the north end, a distance of nearly a mile. Overburden, which averages about 5 ft. in depth, is stripped under contract by an outside excavating contractor. The quarry has been worked to a depth of 36 ft. and under present methods of drilling and blasting, a year's supply is shot at one time. Two drill rigs, one a Cyclone, the other an Armstrong, both electric-driven by 15-hp. motors, are operated throughout the year. Holes are drilled in 2 rows, the first row being placed 15 ft. back of the face, and the second 12 ft. from the first row. Six-inch holes are standard, drilled with a 5-in. bit to a depth of 2 ft. below the quarry floor. Holes in the two rows are drilled in staggered lines. The last shot, which produced 175,000 tons of rock from a total of 140 holes, was fired with Illinois Powder Co., Chicago, Ill., Gold Medal dynamite at an approximate cost of 3½ cents per ton of rock. Each hole was loaded with about 200 lb. of dynamite. One box of 40-per cent strength was placed in the bottom, while 35-per cent strength dynamite was used for the balance of the hole. Two caps per hole, wired to a 440-volt power line caused the detonation.

The next shot, which will be fired in June of 1931, will have a total of 391 holes with an estimated production of 350,000 tons of rock. Many operators doubt the value of shooting down a year's supply of rock, principally because of the large investment involved in the dynamite used. In this instance,



Cone crusher and drive used for recrushing the stone.

Main bucket conveyor from jaw crusher to the crushed-stone plant.

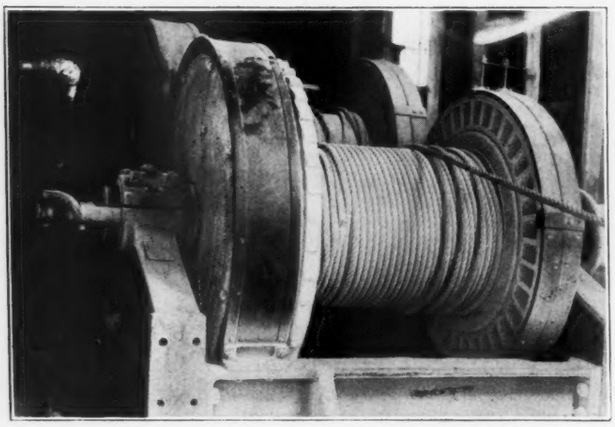


Vibrating screen used for the first classification of crushed stone.

Shovel loading to dump cars in the stone quarry.

however, considerable economy is effected. "By blasting down a long face at one time the quarry shovel requires three cuts to load the blasted rock," according to F. C. Wolf, vice-president. "As the shovel progresses along the first cut, the quarry-car tracks are accordingly moved forward into the vacant space behind it, and when the shovel begins its second cut the track is already in place. Another advantage gained is in the fact that no lost time occurs in retreating the shovel if small daily shots are made. The hazards incident to the daily handling of explosives are eliminated when the job is done in this manner, and large stocks of dynamite are not carried during the greater part of the year, as is customarily the case."

For loading the blasted rock a Bucyrus 50-B excavator mounted on crawlers, having a 1¾-cu. yd. dipper, is employed. Two trains, each headed by a Milwaukee 8-ton gasoline locomotive hauling 3 Western 4-cu. yd. side-dump cars, transport the rock to the jaw-crusher table located at the plant. The track system allows free movement of the loaded and empty trains, there being a single track along the cut with a double track to the crushing plant when a single track leads to the crusher table. One train returns from the crusher waiting on the second track until the loaded train clears the loading track. Then the waiting empty train proceeds on to the shovel position. The length of the track, is approximately three-quarters of a mile.



Hoist used for moving cars in the crushed-stone plant.

Quarry seepage water is drained into a pump near the jaw-crusher house. Here a sizable hole has been blasted out of the quarry floor and, adjacent to it, a pump house has been built. This building serves also as a watchman's shelter house, having a coal stove and locker equipment in addition to the two centrifugal pumps. Both pumps are of Allis-Chalmers manufacture. An 8-in. unit has a capacity of 1,500 gal. per min. against a head of 78 ft., and the other, a 4-in. pump, has a 600-gal.-per-min. capacity against a 65-ft. head. The former is direct-driven by a 30-hp. motor, and the

Pumps employed to draw seepage water from the quarry.

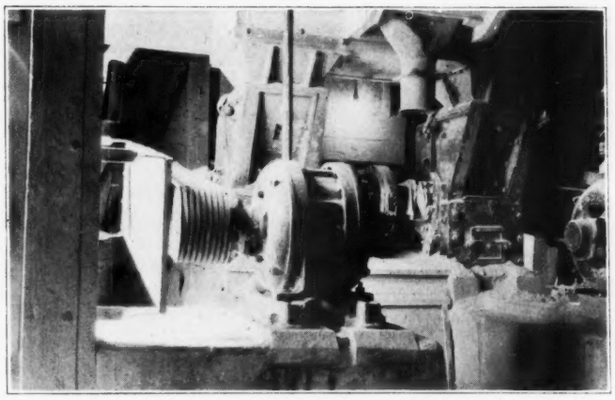
latter by a 15-hp. motor. Both pumps discharge across the highway into the Little Fox river.

For primary crushing of the blasted rock, an Allis-Chalmers 40-in. by 60-in. jaw crusher is employed, reducing the rock to sizes below 8-in. This unit is mounted in a pit beneath the quarry floor and is belt driven from a 200-hp. motor. From the primary crusher, the material is sent to the mill building on an Allis-Chalmers 48-in. bucket elevator 72 ft. long on centers. Material discharging from this elevator falls to a dividing chute, sending part to two Allis-Chalmers type 6-K gyratory crushers, and the balance to an Allis-Chalmers 48-in. re-crusher of the Newhouse type. Each crusher is driven by a 50-hp. motor through a Texrope drive.

All the secondary crushers are set at 2-in. and material from them is chuted to a 28-in. bucket

elevator which carries it to the top floor of the mill for classification. This elevator is 76 ft. long on centers and is driven by an Allis-Chalmers 35-hp. motor.

Two Allis-Chalmers vibrating screens classify the materials into commercial sizes. The first unit is a 4-ft. by 8-ft. 3-deck screen powered by a 5-hp. motor through a Texrope drive. The top deck has 1⅞-in. square openings to screen out possible oversize stone; the second deck with a 1⅛-in. mesh screen produces 2-in. to 1⅛-in. material; the third deck with a ⅝-in. mesh screen produces 1⅛-in. to ⅝-in. material. Throughs from this deck are chuted to a second Allis-Chalmers vibrating screen, this one having a single 3-ft. by 6-ft. deck with a ¼-in.

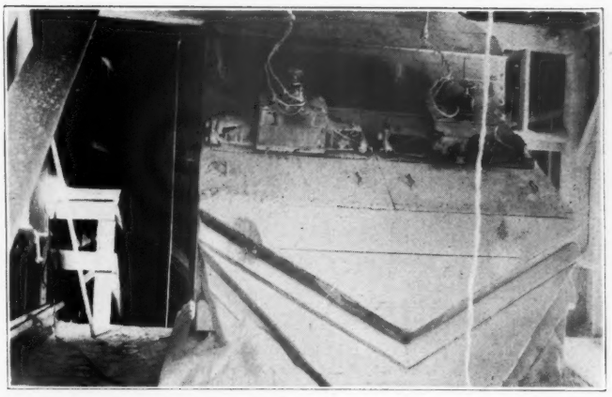


Two pulverizers, driven by separate motors, through multiple V-belts.

mesh screen to screen out the dust from the finer sized stone.

All finished materials are stored in ten bins prior to their shipment. A sidetrack has access to the bin-dumping gates along one side of the bin structure. Cars are spotted by means of an American car-mover hoist located several hundred feet to the north of the plant. This hoist consists of a 2-drum American Hoist & Derrick Co. unit driven by a 125-hp. motor. With a ⅞-in. cable, 1,000 ft. in length, from 10 to 15 cars can be handled at one time.

The crushed-stone plant has a daily capacity of 35 cars of finished materials. Part of this output is sold to the Payne & Dolan Co. for the production of paving materials, and another portion is used by



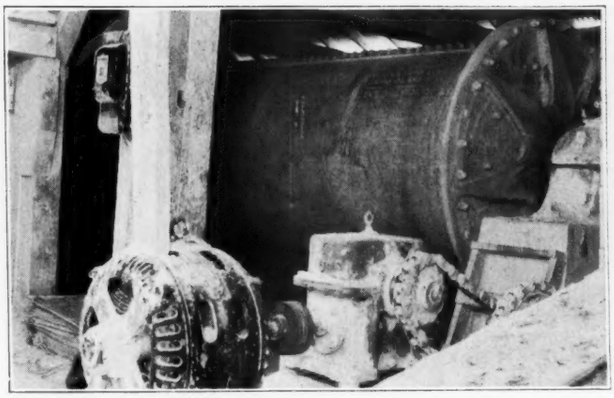
Vibrating screen which grades the finely-ground material from the pulverizers.

the pulverized-rock plant. Located adjacent to one of the storage bins, a Symons 2-ft. cone crusher, driven by a Westinghouse 50-hp. motor through a Texrope drive, recrushes 2-in. stone to ⅝-in. or below. This size of material with all dust removed is one of the basic ingredients of the paving materials.

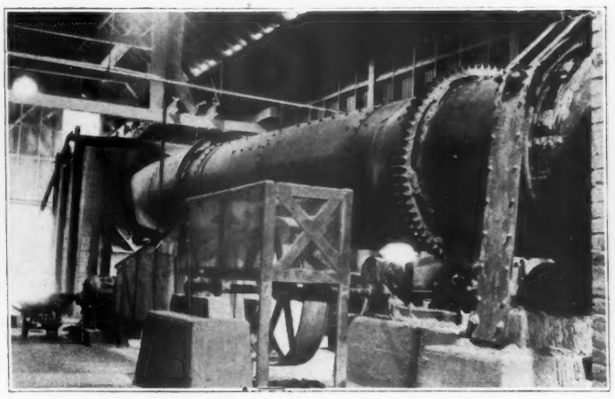
The products of the pulverized-rock plant at the Waukesha company have many commercial uses. For instance, two sizes of crushed stone taken from the preliminary pulverizing processes, are sold for terrazzo interior-finish work. Chicken grit is also produced in this way. Fine screenings, which pass through a 10-mesh screen, are shipped by the carload for agricultural-soil treatment. This product bears the name of Kiln-Dry because of the fact that all the moisture has been driven out in the drying process prior to pulverization. Limestone dust, produced by a tube-mill process, is sold to manufacturers of asphalt products and roofing materials.

Essentially, the pulverized-rock plant consists of a rotary-kiln dryer, a pair of Allis-Chalmers pulverators, several classifying screens, two tube mills and a Bates bagging machine. The building in which this equipment is installed is located adjacent to the south end of the crushing plant. It is served by the same sidetrack.

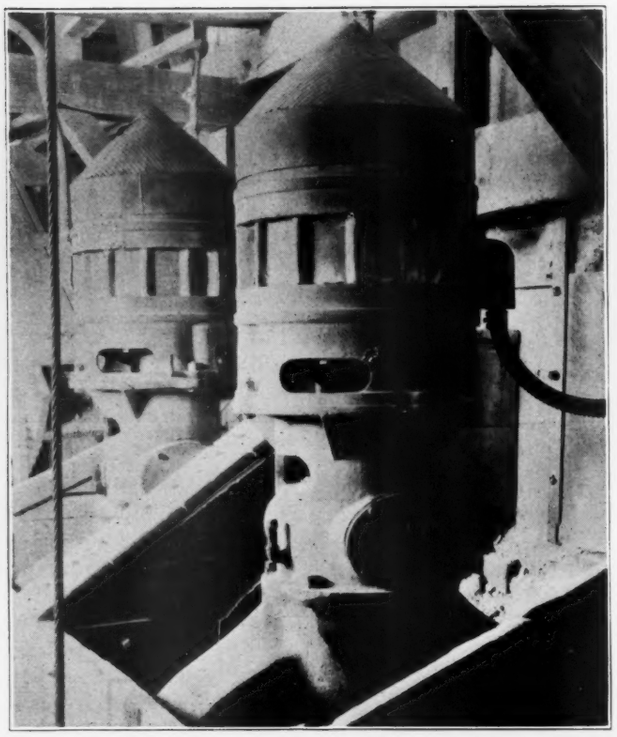
Raw materials for the pulverized-rock plant are taken from the inside dumping gates of the storage bins. A steel Sandvick conveyor with access to each bin-gate, transports the crushed stone to the rotary



Tube mill, showing speed-reducer drive, used to pulverize rock dust.



Oil-fired rotary drier used in the plant where the rock is pulverized.



Two of the four secondary crushers in the gravel plant.

drier. This conveyor is interesting, in that it is made of a 14-in. steel band, quite flexible and much like a steel tape-line. This band is flat on its top surface instead of the usual concave surface of a rubber belt. It travels on horizontal idlers. When asked if the crushed stone rolls off, Mr. Wolf, the vice-president and general manager said: "A marble placed near the tail pulley will travel the full length without rolling off." The selection of the crushed stone for the drier is a matter of choice of the operator. As all the bin material from 2-in. down can be used for the pulverators, surplus material from any bin can be taken by merely opening the bin-gates which feed the conveyor belt.

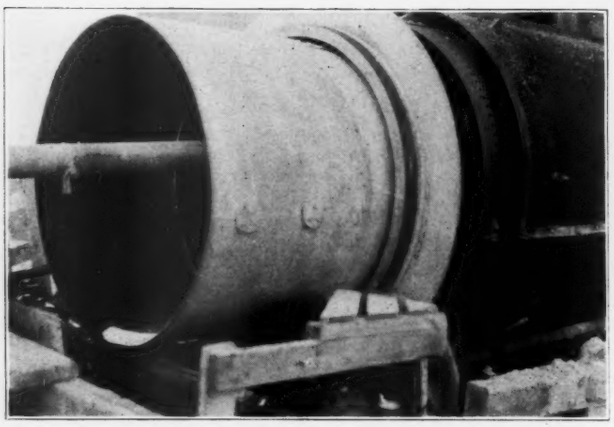
From the Sandvick conveyor, the crushed stone passes into a feeder which sends the material into the rotary drier. This unit is 60 in. in diameter and is 50 ft. long. It is operated at a speed of 6 r.p.m. by a 20-hp. motor through reduction gears, requiring twenty minutes for the material to pass through. Two Johnson oil burners send streams of hot flames into the head end of the dryer. At the tail end, a Chain-Belt Co. bucket elevator carries the dry stone into an overhead bin. The latter serves as a hopper for a short conveyor which feeds the two Allis-Chalmers pulverators. A Dings magnetic pulley installed as the head pulley of this conveyor removes any tramp iron before it reaches the pulverators.

The two pulverators, each driven by a 50-hp. motor, reduce the dry stone to a 10-mesh screen fineness. Material from these machines is sent to the top floor of the building to a Tyler Hum-mer screen which rejects the material above 10-mesh fineness back to the pulverators, or, if desired, the rejects are sent to another Tyler Hum-mer screen which classifies them into two sizes of terrazzo

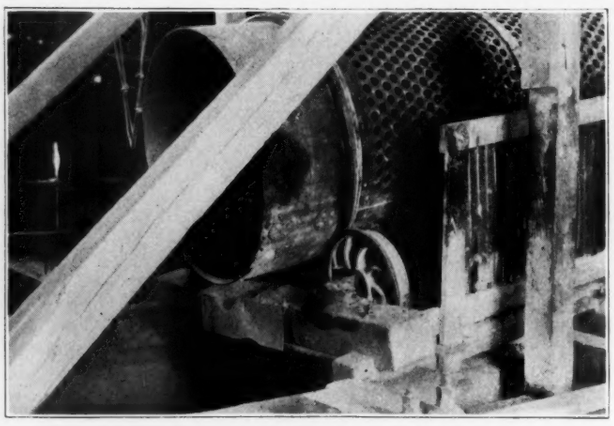
The gravel plant. Loading bins at left, car trestle from pit at right.

stone or two sizes of chicken grit. These products are then bagged and placed on the market in that form.

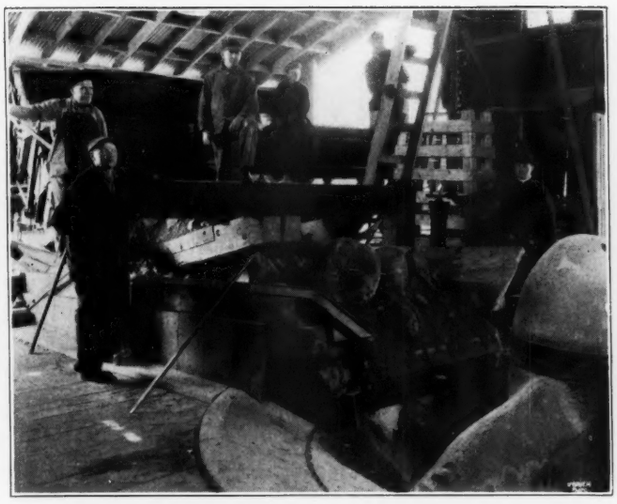
Throughs from the Tyler 10-mesh screen are sent to a bin. Here the material is either spouted to box cars or fed to the two tube mills for fine grinding. One F. L. Smidth and one Allis-Chalmers tube mills are used, installed with their discharge ends together. Each tube mill is 60 in. in diameter, 22 ft. long, and is driven by a 250-hp. motor through a Texrope drive. The tube mill process reduces the material to a 200-mesh screen fineness, 95 per cent of it passing this size screen. From the point of discharge, a 20-in. Chain-Belt bucket elevator carries the rock dust to an overhead bin of 100-ton



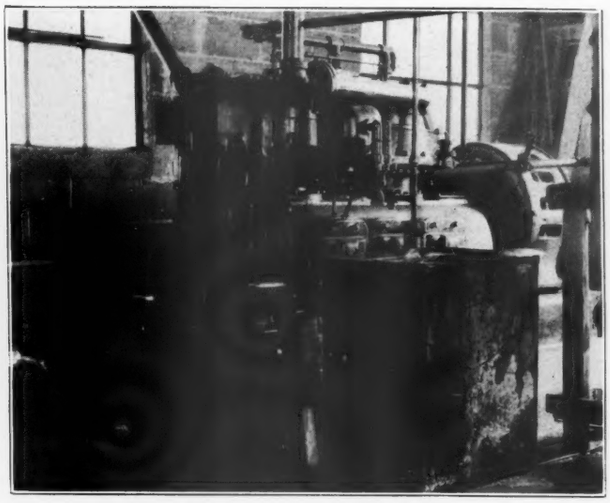
End view of one of the screens showing the concentric screening surfaces.



Rejected material from this scalping screen is sent to the four crushers.



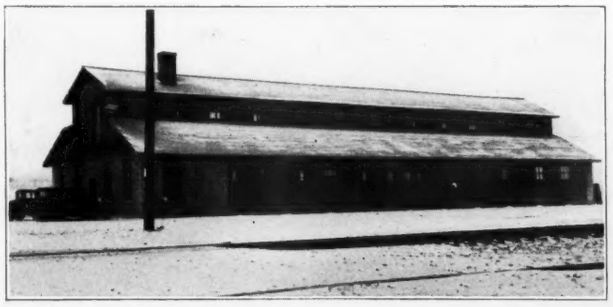
The 60-in. pan conveyor feeding oversize stone to primary crusher in the gravel plant.



This compressor in the repair shop supplies air to the three plants.

capacity. This conveyor is driven by a 10-hp. motor through reduction gears. Underneath the bin a Bates Valve bagger is installed near the sliding doors of the east wall, thus facilitating the loading of the bags into the cars. A drag conveyor, motor-driven through a Jones speed reducer, returns all spill from the bagging machine to the elevator.

As the quarry shovel loads the quarry-car trains, select pieces of rock are laid aside by the shovel operator. Later a truck loads these pieces and transports them to a lean-to building near the sand-and-gravel plant. Here experienced stone cutters cut them into standard thicknesses—4-in., 6-in., and



Garage and building housing the offices of the sand-and-gravel plant.

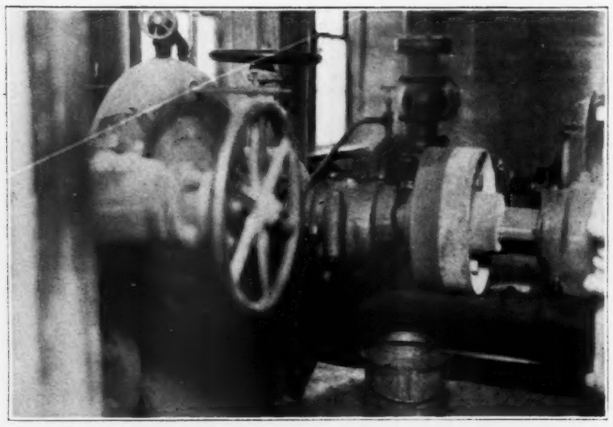
8-in.,—in random lengths. This type of stone is sold under the name of Wisconsin Stone. It is used for the exterior face of residences, doorway arches and general exterior trim. In recent years, a distinct style of residential architecture has been developed in Wisconsin, Illinois and other midwestern states, employing "Wisconsin" stone for exterior facing and trim.

Viewing the sand-and-gravel plant and the pit from Highway 164, one sees a vast cliff-like bank of gravel extending nearly 3,000 ft. This huge deposit is 90 ft. in height, and the company's property holdings include 110 acres to the east of the present workings. After twenty years of production, it seems that the depletion of the deposit has hardly begun, with indication that the supply will last for many years to come.

During a 9-month period in 1927-28, stripping operations were conducted under an outside contract. The overburden averaged 6 ft. in depth and was removed for a distance of 300 ft. back of the bank by means of a Bucyrus 41-B excavator with a 1¼-cu. yd. dipper which loaded it into Western 1½-cu. yd. cars. Five thousand feet of track were required in the transportation of this material to an old pit. A Plymouth 6-ton gasoline locomotive hauled the cars to the point of disposal.

An extensive raw-material transportation system has been built to handle the large volume of sand and gravel handled. On a double-track railroad extending from the Bucyrus 80-B, 2⅛-cu. yd. excavator in the pit to the plant, three trains, each consisting of a Milwaukee 19-ton gasoline locomo-

One of the two secondary gyratory crushers.



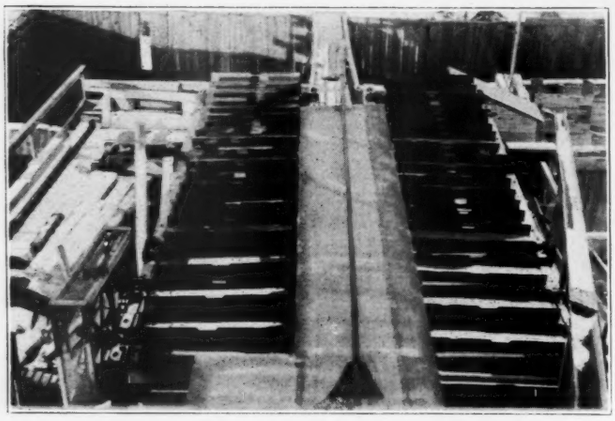
Pumps which supply washing water to the sand-and-gravel plant.

tive and four Continental 6-cu. yd. side-dump cars transport the material to the plant. The latter is built on a site somewhat lower than the level of the pit and, for this reason, the loaded cars reach it via a short trestle direct to the second-floor level. To permit the cars to be unloaded without detaching them from the train, a trestle has been built extending west from the plant providing plenty of room for the locomotive and empty cars while the last car is being dumped.

As 70 per cent of the raw material is large size gravel, the sand is not separated from the gravel before the primary crushing, the loaded cars being dumped directly into the apron of a 60-in. pan feeder to the Allis-Chalmers No. 12 crusher. The feeder is 16 ft. long and is driven through a sprocket-and-chain drive with three sizes of sprockets to permit a variation in its speed. A 30-hp. motor operates the machine. A Wagner 100-hp. motor drives the primary crusher.

All material, after reduction to 4-in. and under by the primary crusher, is sent to an O'Laughlin 60-in. by 12-ft. scalping screen via a 36-in. belt-bucket elevator. The screen has $2\frac{1}{8}$-in. round holes. All material below this size is sent to the washing screens, while the oversize is chuted to four Allis-Chalmers Newhouse crushers set at 2 in., for secondary reduction. One motor, a 30-hp. unit, drives both the elevator and the scalping screen.

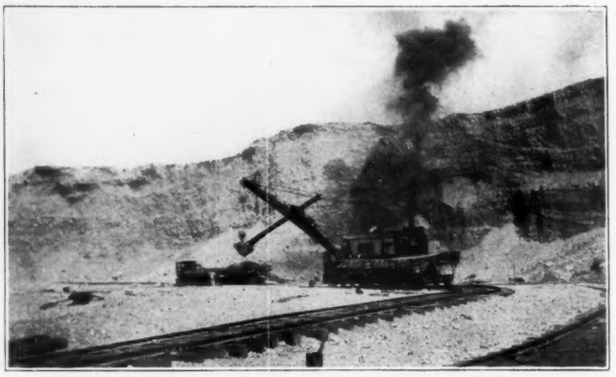
The Newhouse crushers are installed in two pairs, with a large supply bin placed between and common



Twin drags operating in the sand-settling tanks.

to all of them. The hopper of each crusher is at floor level with a wood enclosure surrounding it. Each crusher receives its material through a sliding bin-gate. A 60-hp. vertical motor is mounted integrally with each crusher.

From the four secondary crushers, the crushed material is sent to the washing screens via a 76-ft. belt-bucket elevator, made up of a 38-in. belt with 11-in. by 17-in. by 36-in. buckets.



Shovel loading cars in the gravel pit.

The three O'Laughlin washing screens are placed in a T-shaped position, each screen forming a leg of the T and at a 90-deg. angle with each other. Material from the elevator strikes a dividing board, sending it into the three screens. Each unit consists of three concentric cylinders, the inner being 46 in. by 12 ft., the second, 56 in. by 9 ft. 6 in., and the sand jacket, 66 in. by 9 ft. The first jacket has $2\frac{1}{2}$-in. openings, the second, $1\frac{1}{2}$-in., and the sand jacket $\frac{5}{16}$-in. Each screen is equipped with six Binks washing nozzles which are installed on a pipeline through its center axis. An Allis-Chalmers 75-hp.

Chutes sending gravel to bins. Note washing nozzles on chutes for fine rinsing.

motor drives the three screens as well as the 70-ft. elevator.

From the washing screens, the gravel is chuted to the bins beneath. Each of the chutes is fitted with a short length of perforated screen over which two Binks nozzles send a final spray of water to the gravel before it enters the bins.

The sand from the screens is sent to two settling

Two of the gasoline locomotives used in the gravel pit.

tanks, each of which is 29 ft. 6 in. long and 3 ft. 8 in. deep. A Smith Engineering Works sand drag with 5-ft. paddles is installed in each tank. Only torpedo sand is reclaimed from the tanks, the waste and wash water being sent to an old quarry near by. A 20-hp. motor drives both drag chains.

Wash water for the entire gravel plant is supplied from three Allis-Chalmers centrifugal pumps, which furnish 4,750 gal. per min. against a 70-ft. head. They consist of an 8-in. pump driven by a 100-hp. motor, a 6-in. pump with a 50-hp. motor, and a 4-in. pump with a 30-hp. motor. The latter is installed in an employees' shelter house and supplies water for the shovel boiler.

For storing and loading the sand and gravel, an 8-compartment bin structure provides sufficient capacity for 75 cars of material. Two tunnels beneath the bins permit the cars to be loaded through bin-gates installed under each compartment.

Two railroads, the Milwaukee Road and the Soo Line, pass directly through the plant, affording excellent shipping facilities. In fact, at the sand-and-gravel plant, enough side trackage has been provided for 87 loaded cars on the upper end and 56 empty cars on the lower end. A Milwaukee 19-ton locomotive does all the switching of the cars and transports material in a company-owned gondola car from the bins over a separate 2,000-ft. track to the extensive stock-piles south of the plant.

Over 75,000 tons of material can be stocked in these piles, and three important items of machinery are maintained here at all times for the reloading of cars and trucks: an electrically-operated Koehring crane with a ¾-cu. yd. clamshell bucket, a Bucyrus 20-B with a ¾-cu. yd. Williams bucket, and a Barber-Greene loader having a 5-cu. yd. loading capacity in 3 min.

Stock-pile loader used for loading to motor trucks.

Trucks can be loaded directly under the bins, as a concrete floor has been laid on the railroad bed. Trucking facilities include a fleet of 10 trucks, 8 of which are Sterling of 5-cu. yd. capacity each; another has a 4-wheel rear drive with a 7-cu. yd. body; and another is a Reo platform, 2-ton stone delivery truck. All are equipped with Heil bodies and Heil hoists. A garage, 120 ft. long and 44 ft. wide, provides space for 19 stalls for storing and servicing the fleet, as well as two offices for the plant superintendent.

Near the garage is a 35-ft. by 70-ft. repair shop. Among the principal items of equipment are a National Brake & Electric Co. 208-cu. ft. compressor which applies compressed air for three of the plants, there being 6,000 ft. of pipe lines to the system, two blacksmith's forges, and a drill press.

Another building in the group, 20 ft. by 30 ft. in size, is used for the storage of repair parts and spare motors. Fourteen or more motors are kept on hand at all times to be used in an emergency.

The company also owns 17 cottages, provided so the employees can live near the plant. These cottages are of the 4-room and 5-room types, and are equipped with modern conveniences.

A. S. T. M. Committee Issues Report on Gypsum Products

At the meeting of Committee C-11, held at the Bureau of Standards, Washington, D. C., March 26 and 27, the results of tests on gypsum-board products conducted by various members of the Committee were reported. Based on these tests the Committee intends recommending at the June meeting of the Society a proposed revision of the present standard specifications for gypsum plaster board (C 37-30) and gypsum wall board (C 36-25), as well as a revision of the present tentative specifications for gypsum sheathing board (C 79-30 T).

Additional reports were submitted on the suitability of the modified Vicat apparatus for the determination of standard consistency of wood fiber and ready-sanded plaster which look very promising. It is felt, however, that further investigation is necessary before recommending its adoption as standard.

So far the Committee has been unsuccessful in its efforts to find a positive accelerator of constant composition to be used in place of standard Ottawa sand in the determination of time of set of gypsum wall plaster. Further investigations are being conducted, however, and reports will be submitted at the fall meeting.

Additional reports were submitted on the investigations being conducted to find some simple, definite means of determining the sand content of set plaster. This problem also requires more investigative work, which is being carried on by several members of the committee.

Prof. A. C. Busse.

How to Win an Argument

By A. C. BUSSE and E. E. NYBERG
New York University, New York

The accompanying address was among the most valued numbers on the program of the National Crushed Stone Assn. during the annual convention in St. Louis. The address was a dialogue in which Prof. Busse did most of the talking and acting. In the portion printed herewith, he is the sole character. The remainder of the address will appear in a forthcoming issue.—Editor.

Prof. E. E. Nyberg.

WE offer, as our credentials, the fact that we are practical investigators. As such, we have made a systematic survey of the various types of sales solicitation in vogue about the country, a study on a larger scale than any other investigators have had the time or the opportunity to institute during the past decade or two.

In going about this work of ours, we were lucky in being able to go about it against more than a background of university theory—academic speculation. We were able to initiate it against the background of actual selling experience which was fairly intensive and varied.

I shall never forget my first introduction to the field of face-to-face selling, and I should like to recall it for you briefly because I believe that it is symptomatic of a type of salesmanship from which we are not yet fully emerged, but from which, thank heaven, we are emerging on a national scale.

One spring in college it became rather apparent to me that I couldn't go back to school the following fall unless I made some money in the meantime, and I was approached at that critical time by the district sales manager of a publishing house which specialized in hiring student salesmen to go about the country from door to door selling a compendium of information in which you were supposed to be able to find everything you wanted to know about anything.

He suggested that I make the money I needed so sadly by selling this book. I was alarmed at the idea, until he did a remarkable thing. He guaranteed that, if I would be willing to follow out a certain sales procedure he was prepared to give me, and follow it out mechanically, I would sell six sets of those books a day; and, at 20-per cent commission, that looked good, so I said I would do it.

And so I got my first introduction to actual face-to-face selling, and I certainly will remember it as long as I live. There were six steps in that sales procedure and I am going to recall them rather briefly, if I possibly can.

Now let's suppose that here is a beautiful residential suburb of the city of St. Louis. Here is a street. Here is a house and here are steps leading up to the door. There is a door-bell here, and the door opens this way.

Step No. 1 in this sales procedure was particularly important. I still remember how this fellow emphasized it. No. 1, he said, was to walk up the steps that I have been telling you about and ring the bell. He said I had to do it every time. It was not left to my good judgment or discretion at all. I had to do it.

After ringing the bell, step No. 2 was to hop quickly over to the opposite side of the door, the idea being if I rang the bell and stood there [indicating], the lady would open the door a crack.—"Naw," she didn't want anything. So I quickly hopped over here [jumping to the other side of the door] and the lady would open the door a crack and stick her head out and wouldn't see anything. Then she would open it a little wider, and still she would see nothing. Finally, in desperation, she would swing it widely open, and stepping in front of the jamb—there I was!

The next step in the sales procedure was not to ask the lady if she didn't want a nice fresh book. Oh, no. The next step called for me to take off my hat, and having taken off my hat, to walk into the house. For, to use the somewhat crude language of my sales instructor, "If I wasn't going to walk into the house, why in hell would I take off my hat?" Having walked into the house, the next thing he instructed me to do was to continue to walk through the house, around through the hall, and into the living room. When I protested at that, and said, "What do you think the woman is going to do when she sees me walking all around through the house and into her living room?" he said, "Never mind about the woman. She will follow you!" And it was true. The first time I tried it and summoned courage enough to see if it had worked, there she was, right behind me.

The next step called for me to offer the dear lady one of her own chairs. She would sit down a little gingerly on the edge of the chair, but when she was seated, I would reach inside my coat, where, strapped tightly to my chest so the bulge wouldn't be too suspicious, was this book which I would haul out, open, and hand to her. Having handed it to her, I quickly assumed this position [demonstrating] with my free hand behind my back, so she could not poke the book back at me.

At about this time, my sales instructor had told me—and experience certainly proved he was right—the average prospect would begin to suspect that something was up! Here she was, sitting in the chair she didn't want to sit in, holding a book she didn't want to buy, and talking to a bird she didn't quite know how had gotten into the house, anyway.

The heavy ammunition for this critical step was furnished by the publishing house, in the guise of a big double-spread picture inserted in that book in

such a manner that no matter how the book was held it would quickly open to that picture. It pictured a young farm lad (about my age and the age of the other student salesmen which this company specialized in hiring) leaving the old homestead to make his way in the world. Maybe you remember the picture. The lad has one foot over the threshold, and in the distance loom the spires of the city, symbolic of his efforts to make his way in the world. He has a knapsack over his shoulder and a sack of sandwiches in his hand. His face is turned to say goodbye to his mother. And the dear old lady stands in the background, with her hands clasped and tears streaming down her cheeks, wishing her boy "God Speed and Good Luck."

Well—you could not miss the point. Quite obviously, I was just such a boy, away from my home and mother, and they figured that the motherly instinct of the prospect would be aroused. But they were not content with that psychology, so they put a dog in the picture. What a hound! You never saw anything more miserable than the look on that dog's face as it squatted in the foreground of the picture, looking up at the departing boy with an expression on his face which was just the ultimate in canine misery. I was told to let the prospect look at the picture and absorb it, until just the trace of a tear would form on her cheek. Then I was told to say a clinching line, and I was told to say it with just the right tremor in my voice, "Even the poor dog looks sad!"

Then I was to ask her—not if she wanted the book, even now—but which binding would she prefer, and zip, out would come samples of the deluxe, medium and ordinary bindings. If she did not like the deluxe binding, I spent a second or two trying to convince her that that was an error in judgment, but not too long. The technic now called for me to get her signature for the binding she did prefer, thank her for her order that she really never had given me, ask her the name of the lady next door, go over there, and do the same thing again.

That is the type of salesmanship from which we, as a nation, are emerging. I believe the proof of our emergence will be evident in the report Nyberg and I would like to present and dramatize with a few illustrations. The important thing we wish to get over is that what you are going to hear is a trustworthy report. As I said, it is not the academic speculation of a couple of college professors, but the work of practical observers on the firing line of modern business.

We went about our work in something the same fashion you might imagine a botanist would go about making a study of plants. We studied live specimens in their native habitats, hundreds and hundreds of flesh-and-blood sales solicitations on the firing line. We had as our laboratory (with all due respect to your home towns) what I think is one of the finest laboratories any similar investigators have ever had, that infinitely varied business world of New York City, which, for a period of seven and one-half years, was thrown open to us through the generous coöperation of certain interested business leaders.

I spent one summer in the offices of one of the largest business institutions in the city, listening in analytically on all the different types of sales solicitations that took place in my presence daily. I was always careful to notice why that sales solicitation turned out successfully and why this one, representing a product of equal merit, did not. Similarly my associate found himself occupied in various capacities, listening to different types of sales solicitations, by all the different types of salesmen, to all the different types of prospects, in all the major fields of business activity in the city.

The result was that, at the end of over seven years of observation, we had accumulated in our files over 15,000 flesh-and-blood sales solicitations which one or the other of us had listened to and analyzed. From that great pile of statistical data, we proceeded to generalize slowly and cautiously, I assure you.

The result of that generalization process was the development of a formula covering, not the approach to the sale nor the close of a sale, but the central phase which we have termed, for want of a better term, The Business Argument.

The most interesting thing about that formula is that it consists of just six—half a dozen—almost childishly simple principles of persuasion, yet principles which never before had been utilized in either lecture or text-book form. The only reason, we imagine, is that perhaps, hitherto, they have been considered too obvious to bother about. It won't hurt our feelings at all if that is your first reaction.

When you first hear the statement of these principles, you may say "Good heavens, those are too obvious for you to take our time in telling about them." Our answer is, "No." In the very obviousness of what you are going to hear lies its tremendous significance. These principles are so appallingly obvious that the best of us, the best salesmen and the best sales managers, are violating them all too frequently, and with disastrous results.

Just one word more before we get down to cases. We are able to give you this report with more confidence than we could have done some time ago because, between the time this research was concluded and now, we have had an opportunity to submit this material for the acid-test application on the firing line to well over 300 of the leading national selling organizations, meeting in large sectional or national conventions. And every time we gave the material to the men we were careful to say, "Men, we want you to forget this stuff is based on seven and one-half years of research and on analyses of 15,000 case reports. We want you to do just one thing, try it out in the spirit of intelligent skepticism. If it does not work, please tell us, so we won't go around bothering anybody else."

The reports that have come back to us, on every hand, have been to this effect: that wherever this material is tried out, under intelligent supervision and on a large scale, there follows a measurable increase in sales efficiency, and the only way I know to measure sales efficiency is in terms of dollars and cents. That is why we are able to give you this

report with more confidence than we could have done some time ago.

At the same time, we do not want you to misunderstand us. We are not posing here as master salesmen, trying to tell you how to sell your product. We are offering you a piece of tested research for what it may be worth to you, and we leave entirely to you gentlemen the delicate task of adapting these necessarily composite principles to the special requirements of your own trade.

With that understanding, let's get down to cases. Let's picture here a buyer's office or a prospect's house. The salesman enters. His approach is good because he at once captures the prospect's attention and interest. But the prospect raises an objection, as prospects or buyers have a habit of doing, and the salesman buckles down to the job of overcoming that objection. What follows is the central phase of the average major sales solicitation, and one which distinguishes real selling from a simple order-taking procedure.

If you want to win your business argument and win it in the true sense of the term—win the argument and not lose the sale, win the argument in a minimum of time and with the maximum of good will—we believe it will pay you and your salesmen to practice the following six principles as other successful salesmen about the country are consistently practicing them.

Principle No. 1. During the course of a business argument, watch out that you don't do too much of the talking yourself. Don't talk too much yourself! Now, as you make a mental or written note of that, we want you to forget how simple it sounds. But we want you to picture it as shooting like a comet out of that pile of 15,000 case reports. If you have just ordinary aggressiveness, an ordinary gift of gab, ordinary enthusiasm, it is the easiest thing in the world to take up 90 per cent of the time available for a given business argument with your own comments—or even a hundred per cent. But if you do, your achievement spells your ruin. Your prospect, if he is in earnest in raising an objection, wants to talk, too, and, not only that, he wants to talk about as much as you do. Deny him an opportunity to do his full share of the talking and, although you may not have known it before, these four things happen, just as surely as I am standing on this platform.

In the first place, your prospect stops listening intelligently to what you are saying and maintains a fake semblance of attention. In the second place, underneath that sham exterior of attention, he is turning over in his mind, as you gleefully talk on, the most dangerous material in the world—his objection which your continued verbosity is not giving him a chance to get off his chest.

In the third place, if you talk long enough, that objection inside his head begins to puff up, to inflate, to assume an exaggerated importance and validity, the longer you talk and hold back its adequate expression.

Finally in the event your talking monopoly continues long enough, it is inevitable that your prospect will show some overt sign of irritation and resentment, and when he does—blooey, goes your chance of winning that argument—certainly with a maximum of good will and in a minimum time!

You can state that constructively as well as negatively. Of course, if you want to win your business arguments, you must be a good talker, a clever, enthusiastic and, above all, informed talker. But be a good talker second, and a good listener first. Use just as much conscious technic in prodding your prospect to talk, if he needs it, as you do in prodding yourself to talk. Use just as much sympathetic comprehension in listening to him when he is talking as you use when you are talking yourself.

If you do that, gentlemen, you secure two of the finest strategic advantages any salesman anywhere can secure.

In the first place, you do this fine thing: if you encourage your prospect to do his full share of the talking, you convince him, in the most direct way possible, that you are on the level, that you are on the square, that you are trying to render an intelligent merchandising service rather than merely trying to push through another sale without a complete willingness to understand this man's legitimate objections or his peculiar buying needs.

In the second place, if you encourage your prospect to talk, very frequently you can get him to trot out his most dangerous objection to your offering—one you otherwise wouldn't know he had and consequently not be able to discuss. Did you ever stop to realize that, frequently, the most dangerous objection a prospect can have to your offering is a hobgoblin objection—that is, a plain, damn-fool objection in the back of his mind that he has picked up somewhere and never trotted out and put into words before? Only give that kind of prospect a chance to put that sort of objection into words and, frequently, you need not bother about answering it at all. The process of verbal expression in the proper sales-solicitation atmosphere acts as a cruel clarifier and automatically reduces the average hobgoblin objection to a harmless residue of common sense.

Contrary to a superstition still widely current in the field of salesmanship, an objection your prospect has explained to his own satisfaction is likely to prove less dangerous to you than one he has not thus explained. Remember this: expression deflates and repression inflates. That is why we say that, during the course of a business argument, don't do all the talking yourself!

Now let's hurry on to *Principle No. 2,* which is equally simple and a corollary of Principle No. 1. It is necessary to make it work. Here it is: during the course of a business argument, be careful not to interrupt your prospect in order to answer an objection he has just started to put into words. Don't interrupt. Simple, isn't it? Equally important because frequently violated.

You know how it is. Last month or last week or maybe only yesterday, you were involved in a controversy, let's say with a prospect or a friend. Right in the middle of an objection he was putting into words, there suddenly occurred to you a beautiful

(Continued on page 41)

Quarry view showing well drill at left with shovel loadi ng train of cars in foreground. Note massive formation.

Rock-Like Formation in Northeast Ohio Yields Silica of High Quality

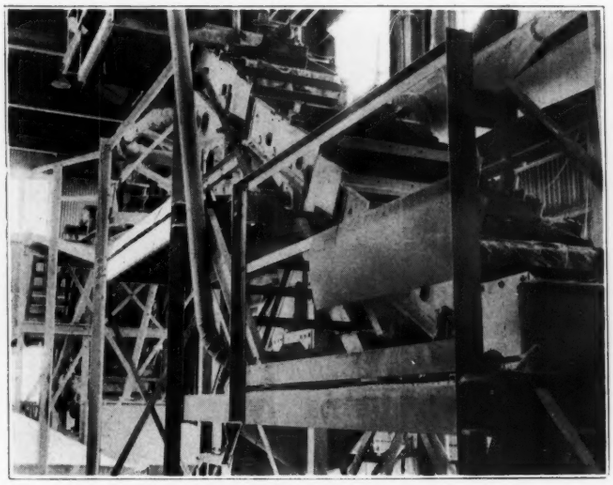
Akron Producer Rebuilds Plant After Flames Destroyed Operations in 1929

By W. E. TRAUFFER

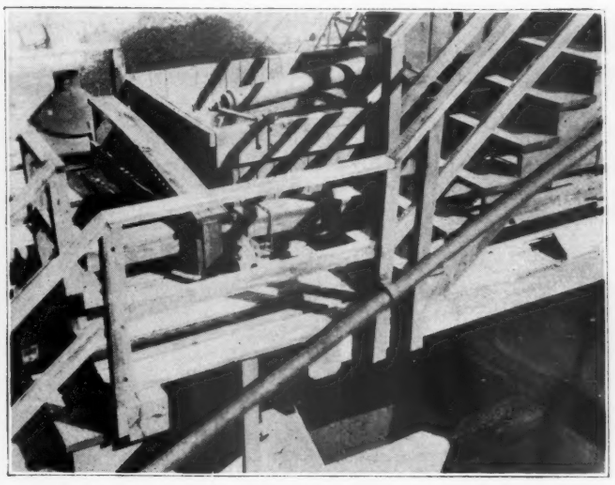
THE production of silica in the United States is an industry in which few plants differ from one another in their deposits of raw material, their methods of operation or their products. In most of them the deposits are sand, ranging from medium to fine in gradation, or sandstone consisting of similar sands held together in various degrees of cohesion. The processes used for reducing these raw materials to marketable form are necessarily much standardized.

For a number of years the Columbia Silica Co. of Akron, O. has been working a deposit near that city. This deposit, which is rather unusual, is a conglomerate of quartz pebbles with a maximum size of about 1½ in. cemented together by silica sand into a rock-like formation. This conglomerate is hard enough to necessitate drilling and blasting like any rock formation but is not so firmly cemented as to make the drilling tedious or expensive.

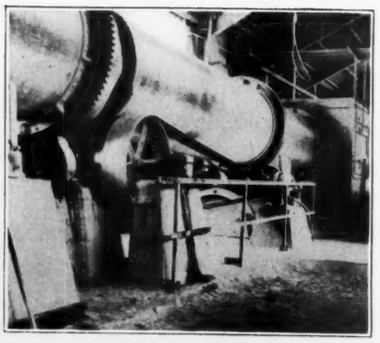
The original plant operated successfully for a number of years until 1929 when it was almost completely destroyed by fire. The wet mill alone was

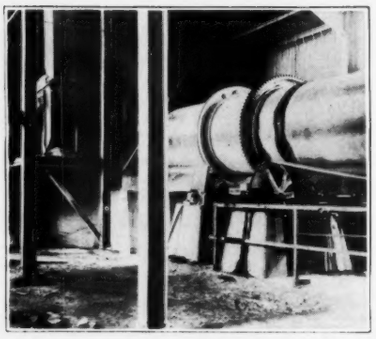


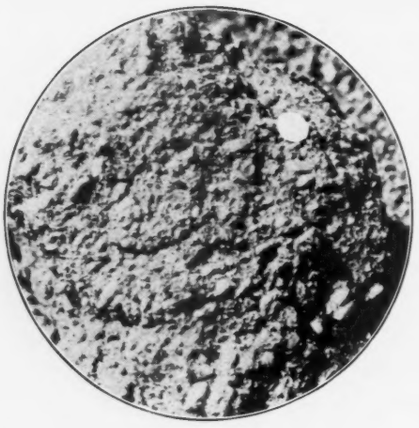
Screening room showing the arrangement of the vibrating sizing screens.



One of the revolving sizing screens in the wet plant with bins below.

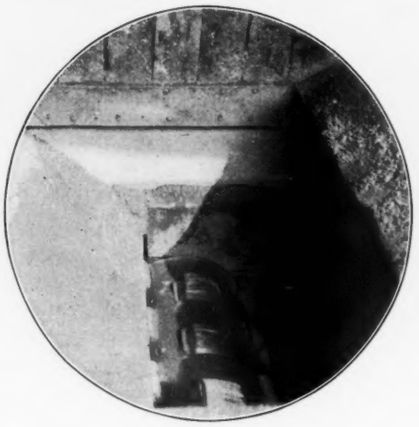


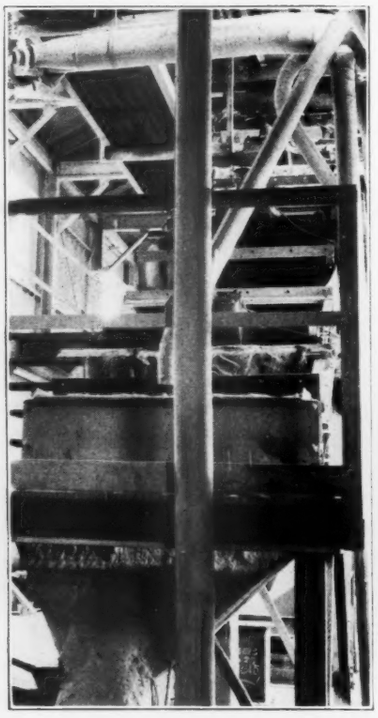




LEFT, reading down—Wet plant at left and dry plant at right, with settling pond in right foreground. Large piece of conglomerate broken down by blast, the white disk in the upper right portion of the circle being the size of a 50-cent piece. Vibrating sizing screens in the dry plant.

RIGHT, reading down—Rotary drier and drive with dust collector in background. Another drier view showing blower at left. Looking down into the slugger-roll primary crusher. Train discharging from trestle to primary crusher with the pond which supplies water to the plant in the foreground.





undamaged. Work was immediately started on a new building with concrete foundations, structural-steel framework and corrugated-metal siding and roofing. It was put into operation late in the same year. The only part of the plant not now entirely fireproof is the wet-mill building which has a wooden framework supporting the screens above concrete bins. As ample washed material is always kept in stock-piles to operate the dry plant for several months, this fact is not important.

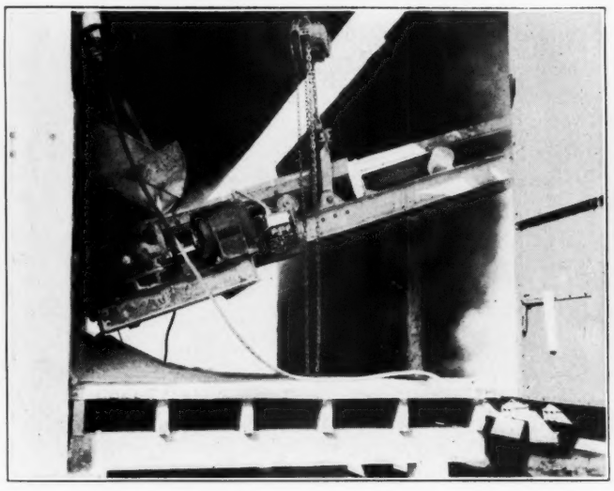
The plant now has a capacity of 750 tons of wet material and 300 tons of dry material per 10-hr. day. Both wet and dry materials are produced in many sizes for different uses. The washed material is separated into five sizes ranging from 1¼-in. down, including two grades of sand. The dry material is made in seven sizes from ¼-in. down. The products are sold for filtration purposes, sand blasting, core sand, traction sand, asphalt sand, and for golf-course traps and greens. It is used also as fine and coarse aggregate in concrete work.

The operation of the quarry and the wet plant

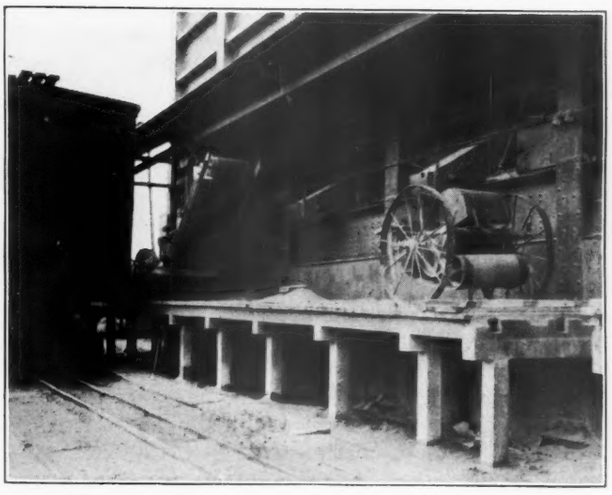
Locomotive crane handling excess sized material to stock-piles.

dry plant through the winter months and to supply the demand for sized washed material.

Ample provision for future expansion was also made in the new mill. All the elevators, conveyors

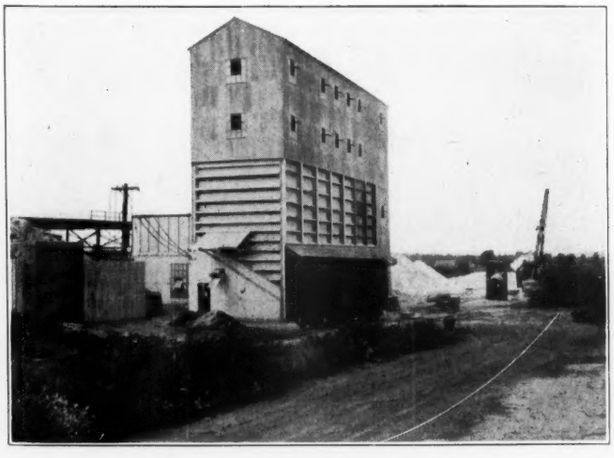


Portable conveyor feeding from bins to box-car loader in car.



The portable belt conveyor, left, and box-car loader at right.

are seasonal, while the dry plant can be operated the year round. For this reason, the capacity of the wet plant was made large enough to allow the storage of a sufficient supply of material to carry the

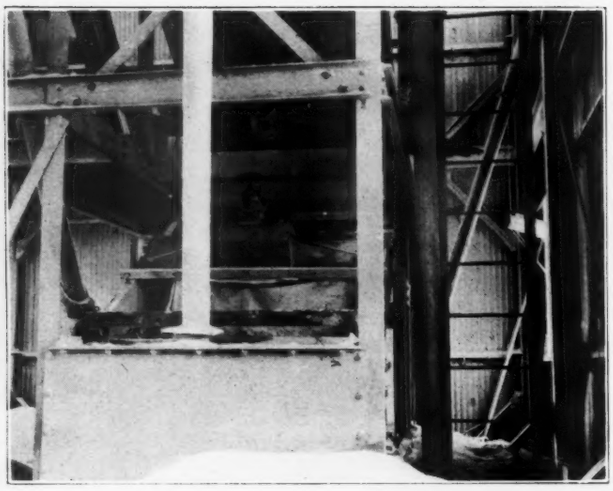


The dry building with quarry track at left and stock-piles in right background.

and crushers are capable of handling double their present capacity. The present installation of vibrating screens occupies only one side of the top floor of the building. To double the plant's capacity it would be necessary only to install a second set of screens similar to the first set. This could be done without interfering with production in any way.

The company's property is located on the Akron-to-Copley highway, about six miles west of Akron. It consists of about 100 acres, about 55 acres of which has a deposit averaging 40 ft. in depth. The silica content of both the sand and pebbles averages almost 99 per cent. An almost perfectly horizontal bed of sandstone under this deposit facilitates laying of quarry tracks and movements of the shovels.

The overburden is very light and is removed by scrapers drawn by tractors. Drilling of blast holes is done by a Sanderson-Cyclone 6-in. well drill. Burton 40-per cent ammonia and gelatin dynamite and Cordeau-Bickford safety fuse are used. Blasts are generally single-row bank shots with as many as 35 holes. Secondary drilling is done with Ingersoll-Rand Jackhamers for which air is furnished by

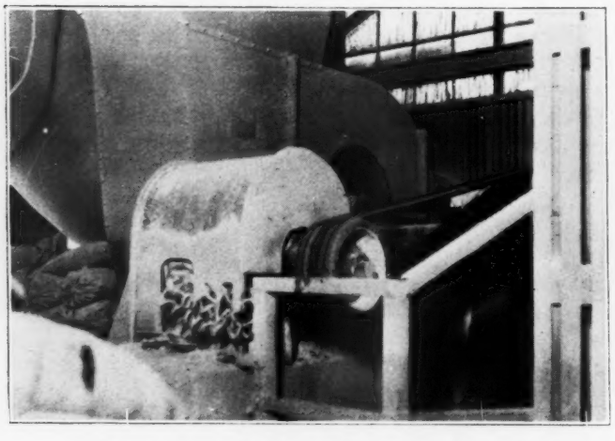


One of the vibrating screens used for fine sizing.

a portable gasoline-driven compressor mounted on a flat-car.

A Marion oil-burning steam locomotive with a ¾-cu. yd. dipper loads the broken material into Western 5-cu. yd.-capacity side-dump cars. These are hauled to the plant, which is across the highway and about one-quarter mile from the quarry, in trains of four, by a 22-ton Vulcan saddle-tank steam locomotive. At the plant the track runs up a dirt fill onto a steel trestle from which the cars are dumped to the primary crusher.

The primary crusher is a 24-in. by 60-in. Allis-Chalmers Fairmount slugger-roll which is driven by a 100-hp. motor. As this crusher is set to produce material 4-in. and under, it is evident that it serves only partially to separate the sand from the gravel without crushing. The crusher discharges to a surge bin from which an inclined belt conveyor feeds a Bartlett & Snow disintegrator which reduces the conglomerate to its original forms of sand and gravel. The material then feeds to a bucket elevator on 60-ft. centers which discharges to a flume to the washer building. The short belt conveyor is driven by a 2-hp. motor through a Falk speed reducer, the disintegrator by two motors of 25 hp. and 35 hp. through Texrope drives, and the elevator by a 10-hp. motor.



The fan used with the dust-collecting system.

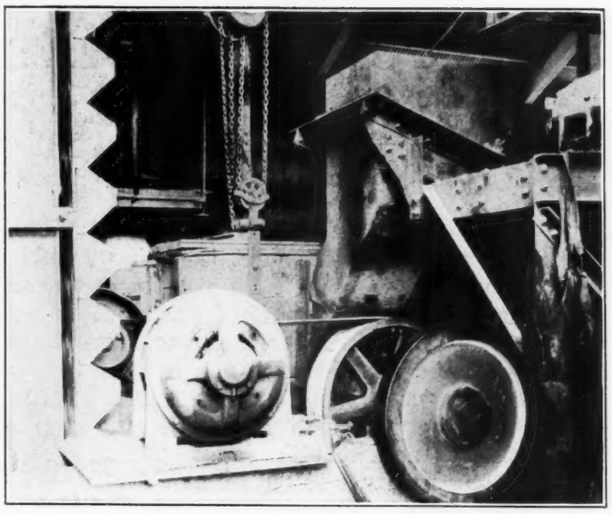
A stream of water at the head of the flume washes the material into the five Stephens-Adamson Gilbert sizing screens which are arranged in tandem over five of the concrete storage bins. The first screen is a double-jacketed scalping screen which removes any refuse or oversize material. The other four are single-jacketed screens which produce three sizes of gravel and sand. The sand goes to a settling box which discharges to the sixth and seventh bins. The waste water is flumed to a reservoir near the plant. The screens are chain-and-gear-driven by a 15-hp. motor.

Any surplus washed material is loaded into gondola cars by a Browning 25-ton steam locomotive-crane equipped with a 1-cu. yd. bucket of the same make. This also rehandles the material to and from the stock-piles and loads from the bins or stock-piles into a 75-ton hopper at the dry plant.

This hopper discharges into a Bonnot 5-ft. by 50-ft. direct-heat drier which is belt-driven by a 15-hp. motor. The waste heat and steam from this drier are carried outside the building by a Buffalo fan. The drier discharges to a steel-inclosed bucket elevator on 51-ft. centers which feeds to a Hum-mer 4-ft. by 5-ft. single-deck, vibrating scalping screen with ¼-in.-mesh wire cloth. The oversize goes by gravity to two Buchanan 14-in. by 24-in. roll mills. These discharge to a short belt conveyor which feeds the material back to the same elevator, forming a closed circuit. Each of the mills is Texrope-and-belt driven by a 25-hp. motor.

The material passing through the scalping screen is taken by a steel-inclosed bucket elevator on 36-ft. centers to an inclined belt conveyor on 36-ft. centers. This discharges to the first of six Hum-mer 4-ft. by 5-ft. sizing screens. These are arranged in two groups, the first of four screens, the second of two screens. In the first group, three screens are in series with the oversize of each screen going to the next and the oversize of the last screen going to storage. The fines of the third screen go to storage, while the fines of the second screen go to the fourth screen and then to storage. The fines from the first screen drop to an inclined belt conveyor on 24-ft. centers which feeds the second set of screens. These produce three sizes of material which go directly to storage. The seven sizes produced are stored in a steel storage bin of seven compartments with a capacity of 300 tons each. The elevator and conveyor are each driven by a 2-hp. motor.

A horizontal belt conveyor on 36-ft. centers, which runs under the bins and projects outside the building, is used for truck loading. When cars are being loaded the material is discharged from the bins onto a 12-ft. portable belt conveyor. This is supported, by a Triplex chain hoist, from a beam over the loading platform and can be moved to handle material from any of the bins. This conveyor feeds to a Sinden box-car loader which distributes the material inside the car. This system of loading has been found satisfactory. Shipments are weighed on a 100-ton-capacity Strait track-scale near the loading platform. The storage tracks have a sufficient grade so that both empty and loaded cars are handled entirely by gravity. A short side-track



The disintegrator and its drive with elevator to wet plant at left and drier in background.

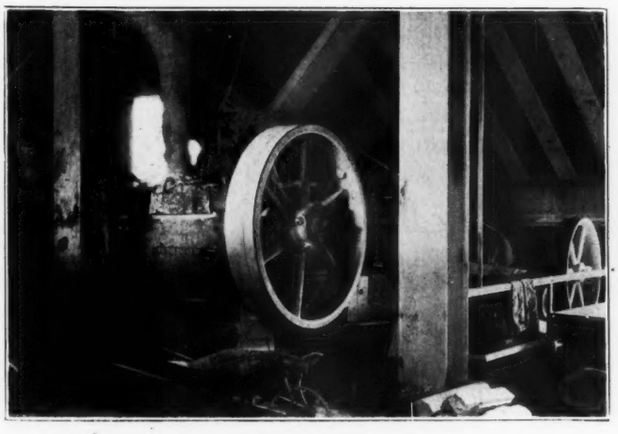
connects the plant with the Akron, Canton & Youngstown Ry. which gives access to all the leading trunk lines in northeastern Ohio.

The Sly dust-collecting system in the dry mill building also produces a marketable material. This is connected to the finishing screens and all other points where the dust is raised. This system has an American Blower Co. fan which is driven by a Westinghouse 40-hp. motor through a Texrope drive. The fan discharges the dust into a collecting hopper from which it is packed in bags for shipment.

Water is pumped from a 15-in. deep well on the property to a large earth-fill reservoir near the plant. It is pumped from the reservoir through a 4-in. line to the plant, by a Union centrifugal pump driven by a General Electric 60-hp. motor. The overflow water from the wet plant goes to a second reservoir where it is allowed to settle before returning to the main reservoir.

The new mill building was fabricated and erected by the Berger Iron Works. All miscellaneous equipment was furnished by the Colonial Iron Works. Stearns-Timken-bearing belt conveyor idlers and Goodrich conveyor belting are used exclusively. The bucket elevators and revolving screens are also equipped with Timken bearings. Operations are controlled with Industrial Controller Co. automatic starters and Square D safety switches.

The office of the Columbia Silica Co. is near the quarry. Officers are: Pierce A. Snyder, president; T. S. Beaven, general manager; and J. S. Cable, sales manager.



One of the two roll mills with V-belt drive at right.

Germany Files Report with League Asking Cement Protection

Germany has recently filed with the League of Nations trade bureau the special prescription which apply to the nomenclature and packing of cement. It forms a part of a rather voluminous report which is intended to protect the import buyers in foreign markets as to the grading of certain commodities.

The protection given to German cement, especially the generic Portland cement, refers principally to its packing in barrels and sacks. The container must bear in prominent lettering the words *Portland Cement*, the name of the firm, or the trade-mark of the plant which produces it, as well as the indication of the gross weight. The degree of pulverization and consistency are determined by further special regulations. Natural cement may not be described as Portland cement.

Production of Gypsum in Nova Scotia Increased Last Year

The gypsum industry of Nova Scotia was active throughout 1930 and the total output showed a marked increase from 143,174 tons in 1929 to 192,-619 last year. One producer was inactive, but the two leading producers increased their facilities and materially augmented their production.

How to Win an Argument

(*Continued from Page 36*)

opening for an immediately crushing retort. In order to strike while the iron was hot, you said right there, "Let me tell *you* something . . . ."

It is true that your interruption enabled you to make a comment a split second or so earlier than you otherwise could have done, but it is likewise true that your interruption did something else about which you were not aware. It irritated your prospect! You might be fooled by the fact that your prospect concealed his irritation behind a cultivated exterior of civility, a cultivated courtesy, but it is there, every time, and it is infinitely more to be feared than the logical victory of your rebuttal is to be desired.

If there is any secret in winning a business argument, it is certainly to avoid all appearance of argument. Make it seem to the other man that you are not arguing in the ordinarily accepted sense of the term at all.

How the Traffic Man Increases Profits by Cutting Distribution Costs

By J. F. CHAMBERS

NEVER has there been a time in the history of the non-metallic mineral industry when a traffic department was more necessary or a traffic manager had a greater opportunity to prove his worth to his organization than now. Owing to the keen competition and the fact that the delivered price is the real price considered, even though quotations may be made f. o. b. plant, the freight charges play a large part in the sale of finished products. In fact, in many cases, such as crushed stone, sand and gravel, the freight charges may be more than the selling price of the material. New forms of transportation have added to the complexity of the traffic man's job.

A plant superintendent who is able to reduce his cost of production as much as five per cent is rightly praised for his good management, and the traffic man who is able to reduce distribution costs by the same amount per ton renders his company as great a service and is entitled to the same praise.

Failure to consider freight charges on outbound shipments as part of the cost of production and distribution has resulted in the traffic being a minor part of many organizations, whereas it should be one of the most important and most profitable.

The traffic department is primarily a service department and should be so considered by every one of its members as well as by the sales department and the organization in general. The slogan of every traffic manager might well be "Service that holds customers." This would mean that an extra effort must be exerted to procure the right kind of cars; to see that they are in good condition for loading and are properly loaded; and, when necessary, to trace them vigorously to destination. Even then the service may not end. If the customer is not well equipped to handle overcharge, loss and damage claims and such claims arise, they should be handled by the shipper.

It is sometimes difficult for the management to see the value of the traffic department, especially if it has not been able to secure a large number of freight-rate reductions. While an annual report of activities should be made, the most forceful way of bringing the department to the attention of the management is through intelligent and honest service to the customer. As an example, when rush shipments are traced, the customer should be advised promptly of all passing records as well as the record of delivery. A letter should be written stating that the carrier has advised that the order was delivered or the car was placed for unloading, that the car was examined carefully before loading and that great care was exercised in loading the car; but that shipments are sometimes damaged in transit due to improper handling, and that, should there be any damage to this shipment, the shipper will be glad to handle the freight claim for the customer. In other words, advertise the department to the customer. These efforts are bound to come to the attention of the management, and it means much more to the president to have a salesman tell him that customers are saying that his company has the best traffic department in the industry than it does for the traffic manager to tell him.

Many shippers have learned the value of a good rate man equipped with a live tariff file through dependence on rate quotations made by railroad clerks. While efforts are being made to simplify tariffs, very little has been accomplished. In some cases, due to the addition of routing restrictions or to consolidated publications, they are becoming more complicated. If the rate quoted the sales department is too high, the business may be lost: if it is too low, the company may have to take a loss.

Checking freight bills and filing overcharge claims may not offer the greatest returns but such practice constitutes a very lucrative branch of a traffic man's activities. It is a common occurrence for a rate expert who audits a large number of freight bills to discover $100 a day in straight overcharges alone, even though some of the bills may have been checked for overcharge by others. It is estimated by experienced traffic men that from 35 to 50 per cent of all freight bills are either overcharged or undercharged and that, as a result, carriers throughout the country are collecting annually millions of dollars to which they are not entitled. More important than filing claims, however, is checking the bills to find errors before they are paid, thus saving the expense of filing claims.

Rates, rate structures and rate bases are being changed constantly and the traffic man should be just as familiar with the rate structure applying from competitive plants as with that applying from his own plant. Applications for rate adjustments before the various rate committees which contemplate a change in the basis for making rates are published in each issue of PIT AND QUARRY. These dockets should be followed closely and changes which might affect the company adversely should meet with strenuous objections. These objections should be addressed to the rate committee chairman and also to each of the interested carriers who participate in the company's traffic.

The confidence of railroad officials is essential for the proper consideration of rate proposals and the traffic man who is over anxious to take advantage of technicalities or obvious errors in tariff publication is not likely to succeed to the fullest extent in obtaining the rate adjustment he desires.

(Continued on page 46)

Delegates and guests who attended the regional cement safety meeting at Davenport, Ia.

Regional Cement Safety Meeting Draws Record Attendance at Davenport

Plants in Iowa and Illinois Participate in Conference; Registration Totals 218

THE sixth regional safety conference conducted under the auspices of the Portland Cement Assn., took place at Davenport, Ia., on April 2. This was the largest held so far this year in point of attendance; the total registration being 213. There were fifty-four out-of-town representatives from the following plants: Alpha at LaSalle, Ill.; Lehigh at Oglesby, Ill.; Northwestern States at Mason City, Ia.; Universal Atlas at Buffington, Ind.; Universal Atlas at Duluth, Minn.; Lehigh at Mason City, Ia.; Medusa at Dixon, Ill.; Penn-Dixie at Des Moines, Ia.

H. F. Tyler, first vice-president of the Dewey Portland Cement Co., was general chairman in charge of the morning session. Stanley Owens, safety engineer of the Portland Cement Assn., was the first on the program and summed up the safety accomplishments of the cement industry of 1930. He was followed by representatives from the mills who read short papers on, "The One Most Effective Measure Employed by Our Company Last Year to Reduce Accidents." These papers were well received and brought about considerable discussion. Rev. George M. McClary, of LaSalle, Ill., who was a guest of John S. Young of the Lehigh Company then addressed the gathering, choosing an inspiring subject, "The Problem of Life." To many present, this was considered the outstanding event of the day.

Stanley Owens.

W. F. Wuerth.

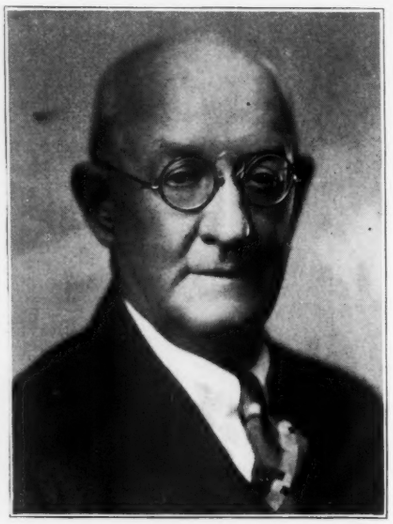
The morning session was brought to a close with a fine paper on "Safeguarding Employees During Maintenance and Construction Work," by J. B. Lewis, assistant general superintendent at the Buffington plant of the Universal Atlas Cement Co.

There were about one hundred at lunch in the main dining room of the Blackhawk Hotel, the chairman of this session being Lewis R. Sims, safety director and assistant chief engineer of the Dewey Portland Cement Co. Eugene Walsh of the insurance brokerage firm of Snider, Walsh & Hynes at Davenport and Dr. L. M. Coffman, spoke at the noon-day meeting.

The afternoon session was opened by Mr. Tyler who introduced R. A. Bechtold, superintendent of Penn-Dixie plant at Des Moines, who served as chairman and John Young, superintendent of Lehigh plant at Oglesby, Ill., who led the discussions throughout the afternoon. Three papers were read on the following subjects: "Accidents Involving

A. S. Hetherington.

Powdered Coal," by D. A. Davis, power engineer, Northwestern States Portland Cement Co., Mason City, Ia.; "The Investigation of Fatal and Serious Employee Accidents," by A. C. Kluck, power engineer, Lehigh Portland Cement Co., Mason City, Ia.; and "The Proper Training of the New Employee," by M. L. Silcox, chief chemist, Penn-Dixie Cement Corp., Des Moines. These were followed by two papers entitled, "How We Organized Our Plant to Win the Trophy"—one by J. W. Temm, chief electrician and chairman of the safety committee, Alpha plant at LaSalle, Ill., and the other by W. M. Powell, safety director, Medusa plant at Dixon, Ill. The afternoon session was brought to a close with a safety contest between teams from Lehigh at Oglesby and Dewey, Davenport, the Dewey team winning the contest with a score of 98.3 per cent. Claude P. Dempsey of the U. S. Bureau of Mines was in charge of the contest and was assisted by Alex U. Miller, also of the Bureau of Mines.



H. F. Tyler.

The safety dinner was served at 6:30, entertainment being provided by Orville Foster's dance orchestra.

After dinner had been cleared, Mr. Tyler introduced Nic LeGrand of Davenport who served as toastmaster. The first-aid trophy, a silver loving cup, was presented to B. F. Quigg, captain of the Dewey team. R. A. Bechtold summed up the work of the meeting in an appropriate style and told about "How to Get the Maximum Benefit from These Safety Conferences."

W. M. Powell.

The principal address of the evening was delivered by Dean Roland L. Philbrook of the Episcopal Cathedral at Davenport. The dean served as chaplain at the Wyoming state penitentiary for some four and one-half years and, being a trained observer, was able to bring to his listeners the substance of a complete education in criminology.

H. F. Tyler, working on the correct assumption that the real measure of the value of a safety conference is based upon the number of men attending, arranged for the Dewey employees to attend the meeting in shifts, some being present for the morning and dinner sessions, and others attending the afternoon and dinner sessions. In this way there were a total of about 160 men registered from the Dewey plant. This is believed to be a record.

The Dewey plant is situated about eleven miles from downtown Davenport and a large number of the visiting delegates left early in the morning and succeeded in getting in a short trip to the plant before the morning sessions. A number of the delegates also stayed over until Friday and were conducted on an inspection tour of the plant.

The largest outside delegation was brought by John Young of the Lehigh plant at Oglesby, Ill., who was accompanied by twelve representatives.

Two unexpected guests who dropped in were W. L. White, Jr., assistant general superintendent and T. A. McGuire, vice president of the Medusa plant at Cleveland. W. E. Wuerth, superintendent of the Medusa plant at Dixon, whose plant won a safety trophy last year, was present and much regret was expressed at the unavoidable absence of G. Lundberg, superintendent of the Alpha plant at LaSalle, Ill., whose plant also won a trophy last year.

R. A. Bechtold.

Lewis R. Sims.

Device for Igniting Pulverized Fuel Said to Minimize Danger

An interesting device was recently brought out which, according to the claims of the inventor, positively ignites pulverized fuel without the least danger. Methods commonly employed for igniting pulverized-fuel furnaces are not at all certain and in many cases accidents and deaths have resulted due to explosions or "flare-backs."

Liquid fuel is used in this igniter ranging all the way from crude oil to kerosene. A flame is produced which cuts a path across or through the pulverized-fuel stream. The flame length varies from 2 ft. to 12 ft. which is sufficient to ignite any furnace or kiln. Within a minute from lighting the igniter and turning on the powdered fuel the furnace is lit.

Not only does this device serve as an igniter but it is also used for actually furnishing heat to a boiler when operating on a very low load or when the boiler is "loafing," as some engineers express it.

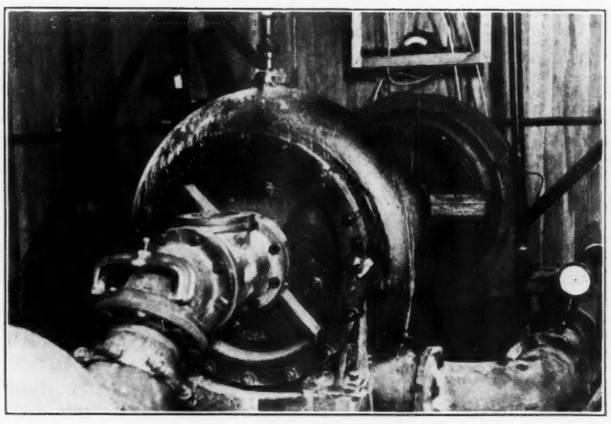
A general view of the plant with the dredge in the foreground.

This Compact Gravel Plant Can Produce 60 Tons of Material per Hour

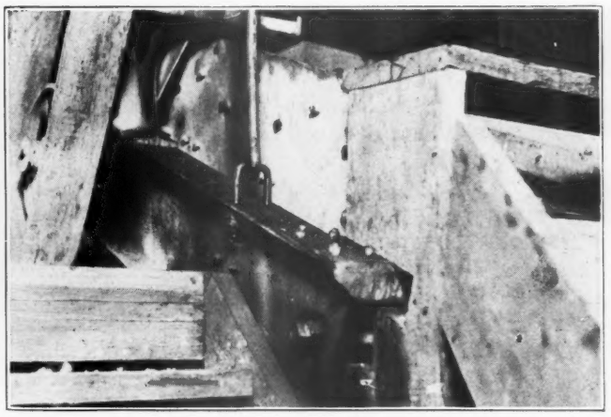
Simple Design Keeps Costs Down While Efficient Operation Yields High Output

EACH year a large number of new sand-and-gravel plants of medium size are put into operation but few of these have any features which would interest the average operator. These plants are generally highly standardized, much more so than the larger plants, and some variation in operation or in the equipment of one of these plants is generally necessitated by varying local conditions.

An exception to this rule is the new sand-and-gravel plant which was put in operation, in September, 1930, by the Batavia Washed Sand & Gravel Co., at Batavia, N. Y. This plant has a capacity of 60 tons per hour and is notable for its simple yet efficient design. The plant was designed by the owners and put into operation inside of 60 days' time. While not pretentious in appearance, the plant turns out four sizes of gravel and two of sand, all thoroughly washed and accurately sized, in quantities that many an operator of a much more pretentious and expensive plant might envy. This does not mean that the plant is a temporary affair or that the owners skimped on the equipment. It is a permanent plant in which only the best of equipment is used. Its simplicity of design is responsible for the low first cost and the low operating cost.



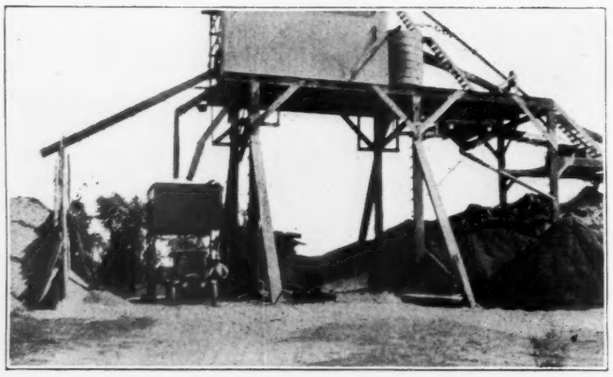
The 8-in. dredge pump with stone trap at left.



One of the vibrating screens in the screening building.

The property owned by the company consists of 38 acres on the outskirts of Batavia, which is a town of 16,000 population located about midway between Buffalo and Rochester, N. Y. The overburden and some of the surface gravel were removed in the past by the New York Central Ry. whose main line bisects the property. The remaining deposit averages about 40 ft. in depth and consists of about 60 per cent sand and 40 per cent gravel with little of the latter over 2½ in. in size.

The dredge has a wooden hull and superstructure, and the intake is supported by a 37-ft. timber boom suspended from an A-frame. The Hetherington & Berner 8-in. dredge pump is direct-driven by a General Electric 150-hp. variable-speed motor and is protected by a stone-trap on the intake line. A Domestic single-drum hoist, driven by a Burke 10-hp. motor, handles the intake boom. The present 32-ft. suction pipe allows the pond to be dredged to a depth of 20 ft. Later this pipe will be lengthened to permit dredging to a 40-ft. depth. The



Another view of the plant showing a truck loading under the bins.

dredge is held in place or moved by means of hand-operated shore lines.

The 8-in. discharge line to the screening plant is about 200 ft. long. It discharges to a steel-lined box which breaks the force of the flow and then onto a Summit double-deck vibrating screen. The top deck is a perforated plate with 2¾-in. square openings and the bottom deck has ¼-in. openings. The oversize is chuted to a waste pile and the gravel from the second deck drops to a triple-deck vibrating screen. The top deck of this screen has 1½-in. and the second deck, ¾-in. openings. The lower deck has ¼-in. perforations on its top half and 7/16-in. on its bottom half. In this manner four sizes of gravel are produced. These are chuted into two steel bins alongside the plant, each with two compartments. Each of the four compartments has a capacity of 8 cu. yd. These bins discharge directly into trucks for shipment.

The sand and water from the first screen go through a flume to a wood-stave, steel-ribbed tank. Another flume near the top of this tank carries away the water and silt.

The sand feeds from the tank to a trough where it joins the sand passing through the bottom deck of the second vibrating screen. The sand then goes to a series of three Stephens-Adamson 4½-ft. sand-settling tanks. The first two produce concrete sand and the third, masons' sand. Both sizes are chuted to stock-piles under the plant. Loading from stock-piles was done, during the past season, with a small rented power shovel. A new shovel will probably be purchased for the coming season.

At some time in the future provision may be made for the loading of railroad cars. This will be done by installing a conveyor in a tunnel under the plant which will discharge directly to cars on a siding which is already in place.

The plant is owned by five men all of whom are actively connected with its operation. They are: F. G. Feitshaus, president and general manager; John Wade, vice-president; G. T. Walker, treasurer; F. R. Miller, secretary, and Frank Geyick.

Traffic Man Increases Profits

(Continued from page 42)

Formal complaints before the Interstate and the state commissions should be considered only as a last resort, but they are frequently necessary and there can be no doubt about business and profits for many of the companies in the non-metallic mineral field through the decisions of the various commissions.

Transportation is undergoing a rapid change. Shipments which formerly moved by express may now be moving by air, mail or truck and much of the former less-than-carload business is going to the trucking companies, while much carload business is going by truck and by water. A complete study of the advantages and disadvantages of each method is necessary to determine which is best for a particular situation.

There should be the fullest coöperation between the shippers and carriers in solving transportation problems. No better agencies for promoting a feeling of friendship between railroad men and industrial traffic managers has been found than the local traffic clubs and the regional advisory boards. Active interest in the activities of these organizations will make the profession more enjoyable and more profitable.

The sales which are made directly by or indirectly through the efforts of the traffic department will vary with the various industries, but every member of the traffic department should be just as interested in making sales as though he were a member of the sales department. The traffic manager should, on account of his contacts, be able to close some sales which the ordinary salesman could not handle. The traffic department should be as profitable from a sales standpoint as from a purely traffic standpoint.

Considering the traffic department as the service department of the organization, the savings it is able to effect and the sales it is able to close make it a bi-profit department. It adds to income—it incurs no additional expense. Taking one per cent of gross sales as the average net profit of the plants in the industry, a saving on claims collected or claims prevented amounting to only $1,000 a year is equivalent to the net profit on $100,000 of gross sales.

The Selection of Electric Motors and Devices for Their Protection

By H. L. SMITH
Industrial Engineering Dept., General Electric Co.

"WHICH type of motor is best for my purpose?" In answering this question, it is necessary to determine the requirements of a motor which is to operate successfully under given conditions. When considering permanent installations it is always economical to make a preliminary study of the conditions to be met, that an intelligent application of motors may be made and suitable devices installed for their protection.

A motor develops torque and speed, the two elements required to drive any load, but temperature rise must also be considered. To operate successfully, a motor must be of such size and design that it will start and accelerate under any reasonable load which it may be called upon to bear, carry any reasonable overload, and be capable of carrying its normal load for the period of time required without bringing about a temperature rise which would cause deterioration of the insulation.

In selecting a motor, the starting and accelerating torques should be a primary consideration. After the starting torque requirements of the driven machine have been determined, the ratio of starting torque to normal torque should be noted. This ratio, if relatively large, indicates that a slip-ring or high-resistance rotor alternating-current motor is preferable to the standard squirrel-cage motor, and a compound or series-wound direct-current motor should be selected in preference to a shunt-wound machine. A similar method may be used for service requiring frequent starting, and careful consideration of the starting and accelerating torques frequently permits the selection of a motor of a smaller horsepower rating than could otherwise be employed.

The point of next importance is the peak load which may be encountered. Ample margin must be allowed between the requirements of the driven machine and the maximum torque developed by the motor. For example, if an induction motor were selected with a maximum running torque only slightly greater than the peak load, it is possible that the motor would stall were the voltage to fall at the time this peak load occurred.

The next consideration is the horsepower rating. This is a measure of the motor's ability to do the required work for a specific period without exceeding the safe heating limit or violating other requirements of successful operation, such as good commutation.

It might be noted here that neither of the ratings, whether 40 deg. or 50 deg., indicates the temperature rise which will be obtained, but simply the limit of the temperature rise which should not be exceeded.

The great number of available alternating and direct-current motors can, from a standpoint of speed, be divided into four groups as follows:

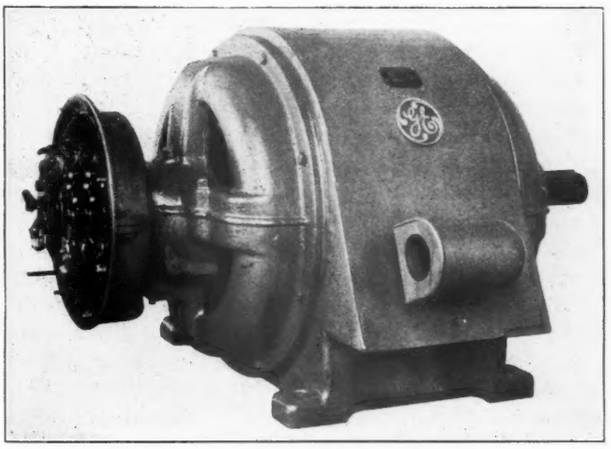
Constant-speed Motors.—The speed of these is either constant, as with a synchronous motor, or does not vary materially with the load, as in the case of squirrel-cage motors, slip-ring motors with rings short-circuited, and shunt-wound, direct-current motors.

Multi-speed Motors.—These may be two-, three- or four-speed, and may be operated at any one of the several definite speeds, each being practically independent of the load. Examples are direct-current motors with two armature windings or induction motors with primary windings capable of various pole groupings.

Adjustable-speed Motors.—This group covers motors whose speeds can be varied gradually over a large range and, when adjusted, remain practically unaffected by changes in load. Shunt-wound motors designed for speed variation by field control, and alternating-current, brush-shifting motors with shunt characteristics are in this group.

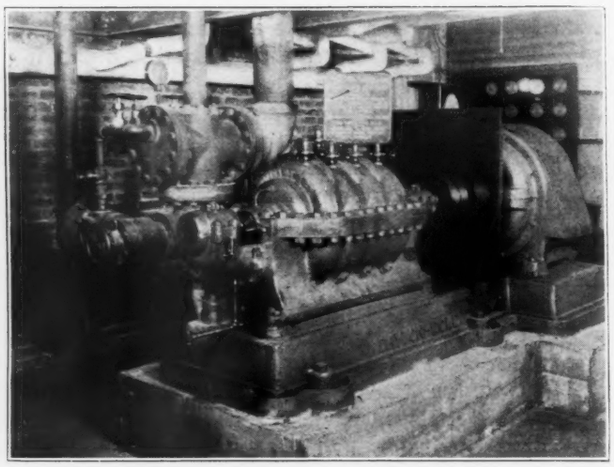
Varying-speed Motors.—The speed of such motors varies with the load, ordinarily decreasing as the load increases. This covers direct-current series motors, compound-wound motors with light shunt fields, and high-resistance, squirrel-cage motors. As a sub-class of these varying-speed motors there is the adjustable varying-speed motor, the speed of which can be varied over a wide range but in which the speed, when once adjusted for a given load, will vary greatly with changes in load. Examples are the slip-ring motor operating with resistance in the secondary circuit and the alternating-current, brush-shifting motor with series characteristics.

Whether alternating-current or direct-current motors will be used is generally decided by the type of power available. As most central stations gen-



Induction motor showing outside inclosed collectors.

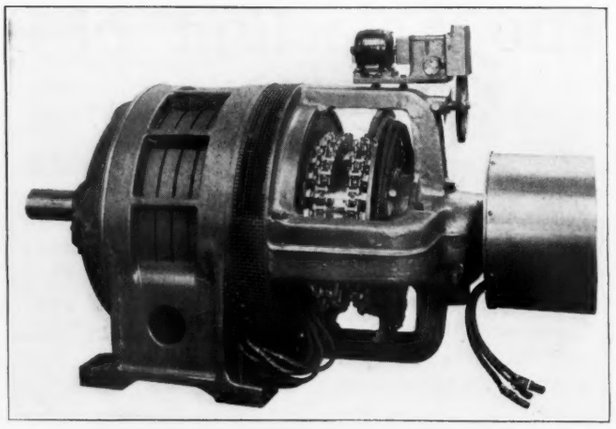
erate alternating current, it is desirable to use alternating-current motors. The alternating current motor has the advantage of being very simple, of sturdy construction, and a low first cost. For constant-speed service, the squirrel-cage induction motor is the simplest and is suitable for all applications where the torque required during starting is not abnormally high. The squirrel-cage induction motor is, therefore, the most common motor to be found in any industrial plant. Its one disadvantage is the high current drawn at starting and, in motors above 7½ hp., it is usually necessary to reduce the voltage applied across the motor terminals at starting. This may be done by inserting resistance in series with the primary winding or by means of a compensator. The first, which is a resistance starter, is cheaper and well adapted for motors up to 20 hp., provided the starting torque required is low (50 per cent of full load). Above this, however, the compensator is more desirable as it has the advantage of a higher torque per ampere of starting current than the resistance type of starter.



Wound-rotor induction motor coupled to four-stage centrifugal pump.

Squirrel-cage motors which are suitable for full-voltage starting are now available. On this type the starting current is greatly reduced from that required by the standard type of squirrel-cage motor, especially on high-speed units. In the smaller sizes, these motors are designed to give a high starting torque, making them especially suitable for many loads which formerly required the use of slip-ring motors. This type of motor is being widely applied for driving power-station auxiliaries, largely because of the simple control required, consisting of a line switch only.

On loads requiring comparatively high torque during starting, it is best to use a slip-ring induction motor, although there are certain cases where high resistance, squirrel-cage motors are suitable. The slip-ring motor has the advantage that the current during acceleration can be limited, this being usually an average of 125 per cent of full-load current. This makes a slip-ring motor especially suitable for large sizes and where the capacity of the system is comparatively small.



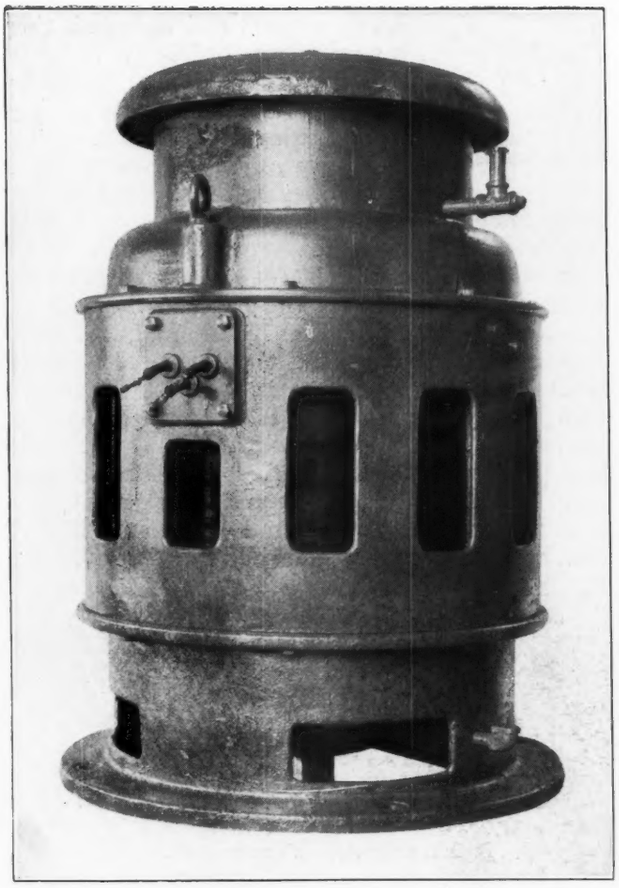
Adjustable-speed motor with pilot-motor brush-shifting device.

The slip-ring motor is also used where the equipment must be operated at different speeds, these motors being suitable to operate down to 50 per cent speed by inserting resistance in the secondary. It is not advisable to reduce the speed below 50 per cent as the motor has a series characteristic with resistance in the secondary, which may cause instability at less than 50 per cent of full speed.

When a slip-ring motor is operated at reduced speed by using resistance in the secondary, power is wasted in this resistance, this power being practically proportional to the reduction in speed. When the load is such that the motor must be operated for long periods at greatly reduced speeds, it is often more economical to use a brush-shifting type of motor which has a very much better efficiency, as well as power factor, than the corresponding slip-ring motor at reduced speed. For this reason, many series-type, alternating-current, brush-shifting motors have been used for driving mine fans and forced-draft fans in power houses. There are now two types of alternating-current, brush-shifting motors: one with the series characteristic, the other with a shunt characteristic. The former is suitable for such loads as fans and pumps. The shunt type, as its name implies, has a very small change in speed with changes in torque after the speed has been adjusted for any particular load. As well as being adapted for driving fans and pumps, this type of motor is especially suitable for driving stokers or for any load requiring adjustable speed on which the variation of speed with changes in load must be small.

Another type of alternating-current motor which has a wide field of application but which has not been as extensively used as the induction motor is the synchronous motor. This type has a constantly increasing scope of usefulness. Among the various applications may be mentioned the driving of motor-generator sets, air and ammonia compressors, stone crushers, centrifugal and reciprocating pumps, fans, blowers, tube mills, and cement mills.

The synchronous motor is especially suitable for direct connection to machines operating at relatively low speeds. An induction motor, when designed for a great number of poles to operate at a low speed,



A 2,200-volt vertical induction motor.

has a very poor efficiency in small sizes and an even worse power factor. The synchronous motor for the same condition has a relatively good efficiency and is even cheaper. For this reason, the synchronous motor has probably found its greatest field in driving low-speed machines similar to air compressors.

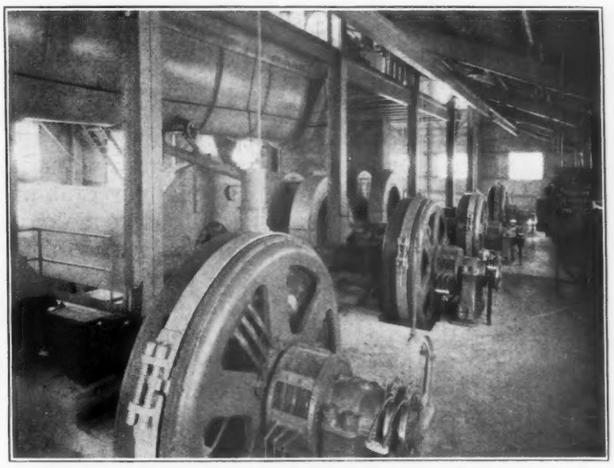
Synchronous motors today are made self-starting and synchronizing and are equally as reliable as induction motors. One distinct advantage of the synchronous motor is that it can be operated at unity power factor or at a leading power factor. Operating at a leading power factor, these motors furnish reactive kva. for power-factor improvement at a minimum cost.

Investigations are continually showing that most plants are over-motored. Often a rearrangement of motors, allowing each motor to operate close to its rated load, will result in a marked improvement of the power factor.

There are certain steady loads in most plants to which an ordinary synchronous motor can be applied and operated at leading power factor to supply the reactive kva. for power-factor improvement. In connection with power-factor improvement, it may be noted here that, if synchronous motors cannot be applied, the necessary amount of leading reactive kva. can be readily secured by means of either synchronous or static condensers, allowing the motors, in general, to be of the simplest possible type.

As a synchronous motor operates as a squirrel-cage induction motor in starting, it is not suitable for starting heavy loads. A special type of synchronous motor has been developed, known as the super-synchronous motor, to meet these conditions. The essential difference from the ordinary synchronous motor is that the stator frame is so arranged that it can rotate and is also supplied with a hand brake. This motor is started in exactly the same manner as an ordinary synchronous motor, but instead of the rotor turning, the stator revolves and comes up to full speed, at which time field voltage is applied and the motor is synchronized. The hand brake is then applied to the stator, gradually reducing the speed, the rotor starting up at the same time. The braking on the stator is increased until, finally, the stator comes to rest, at which time the rotor is revolving at synchronous speed. The great advantage of this motor is that it exerts maximum pull-out torque for starting and accelerating the load, making the motor well adapted for drives which are entirely unsuited for operating by the standard type of synchronous motor without requiring the use of magnetic clutches.

The direct-current motor most commonly used is the shunt-wound type, applicable for all drives demanding constant load and where rather close speed regulation is required. This type of motor should also be used where adjustable speed is necessary. The compound-wound motors should not be used for adjustable-speed service, but are suitable for adjustable varying speed or so-called constant speed. The compound-wound motor is especially applicable where loads demand high torques for heavy starting duty. Series motors are used where high torque is demanded and where high speeds and light loads are not objectionable. These motors, however, should never be belted.



Super-synchronous motors driving cement-grinding mills.

Motor Protection

There are different means of overload protection: fuses; overload relays with instantaneous trip; and overload relays with time delay. These last may be of the thermal type (either adjustable or non-adjustable), in which the time delay is inherent, or of the plunger type, in which time delay is secured by a dashpot or bellows.

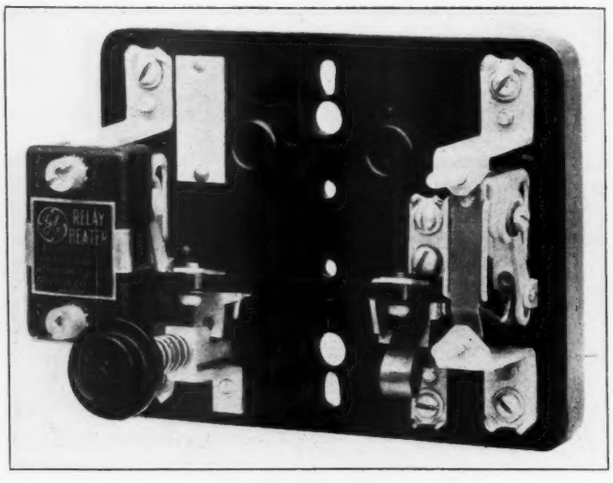
The fuse is the oldest form of overload protection and possesses a certain inherent time delay; i.e., it will not blow instantly at current in excess of its rating but, if this excess current is left on long enough, it will blow. This time interval, however, varies considerably with the same rating of fuse made by any one manufacturer and the same rating of fuse made by different manufacturers. Due to this inconsistency in fuses, they do not give proper overload protection for motors.

The squirrel-cage induction motor, the most popular motor in this country today, takes from five to eight times full-load line current when started on full voltage and, even when started by means of a compensator or resistance-type starter, takes two or more times normal current. Thus any fuses protect only against short circuit in such service unless a double-throw starting switch is used and, even then, the chances are that the constant blowing of a fuse will result in the use of larger fuses until, eventually, no overload protection is provided.

On slip-ring motors and direct-current motors, a fuse of about 125 per cent full-load motor current is used and is generally satisfactory in starting but the same general statement applies, i.e., the constant blowing of a fuse on overloads will result in the substitution of a larger fuse. Although a fuse does not give proper overload protection for a motor, it does give very good short-circuit protection and is, therefore, well adapted for use in conjunction with other types of motor-protective devices.

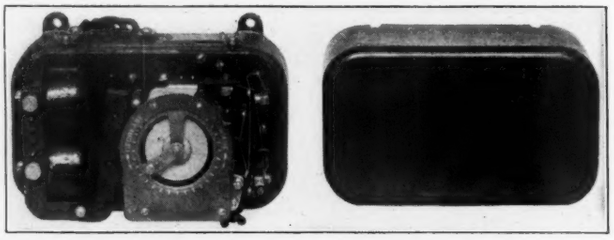
The second form of protection is the overload relay with instantaneous trip. This trip is usually set at 160 per cent full-load current and should be used only for special applications where the device must be stopped instantaneously at a certain load.

The third form is the overload relay with time delay. On squirrel-cage induction motors, this must be set so high as not to trip under starting conditions, and this setting is usually 125 per cent of full load. On direct-current and slip-ring motors, a setting of 110 per cent full load generally takes care of the starting conditions. It may be pointed out here that this type of relay has both a current setting and a time setting, and frequently these two are confused. Properly applied and adjusted, this type of relay gives good motor protection.



A temperature relay.

The fourth type is the thermal device, which is the latest form of motor protection. Motors driving loads requiring high starting torque, such as on cranes or hoists, must have very large fuses or high settings of relays, which means that short-circuit protection only is provided. Further, every motor is capable of carrying a heavy overload for a short period of time and this period is longer than that given by the commercial form of instantaneous or time-delay overload relay. If the relay is set high enough to preclude operation on the short-time overload the motor can stand, it leaves the motor without adequate protection in case of a prolonged overload which would not trip the relay but sufficient to burn out the motor. As long as a motor performs its duty and does not reach a dangerous temperature, there is no reason for disconnecting it from the line, even if it should be carrying overload for a time. It is evident that a motor which is just starting up and is cold can carry an overload for a longer period of time than the same motor could if this overload occurred when the motor was already hot. The commercial form of instantaneous or time-delay overload relay cannot consider these points.



Definite time relay with cover removed.

The ideal form of relay would be one that follows the thermal characteristic of the motor very closely. Thermocouples in the motor winding meet this requirement very well but are too expensive except for the larger sizes of machines. The thermal devices just mentioned under the fourth group come nearest to fulfilling these requirements. There are two forms of this relay: non-adjustable and adjustable. A non-adjustable form is the thermal cutout. There are two forms of the adjustable device. The cheaper is one in which the current to the motor flows through a coil, heat from which is radiated to a strip of metal which expands and trips the device. This relay follows the heating of the motor closely during ordinary operation. The other form is made of two elements: one a mass of iron corresponding to the iron in the motor, the other a heating element corresponding to the windings of the motor. The operation of the relay is dependent upon the expansion of a strip of metal which, due to the above arrangement, follows the thermal characteristics of the motor extremely closely. These thermal devices are not suitable for short-circuit protection but, used in conjunction with fuses back in the line, give the best form of protection.

Thermal cutouts are now furnished with a mark-

(*Continued on page 54*)

Should the Big Associations Merge?

Producers and Equipment Manufacturers Both Favorable as Plan Gains Momentum

Gravel Producer Claims Much Good Would Result

To the Editor:

We have carefully read the editorial on the proposed merger of the sand-and-gravel and crushed-stone associations as printed in the issue of February 11. It is our belief that two associations so closely allied could derive great benefits from joining together for various reasons, and that they would experience no major handicaps in so doing. We feel that good, honest coöperation can do more for a concern that is doing business than a feeling of jealousy and rivalry.

There is no doubt but that it would be a wonderful thing for the exhibitors of equipment, and in this respect there certainly would be no objections to the proposal.

We feel, after reading your editorial, that you have the right idea and would like to see you further the project to the extent to which we know you are able.

The editorial regarding the cement industry, on the same page, was also of interest to us.

RAY E. WALKER CO.
Birmingham, Mich. Kenneth S. Green.

Lower Machinery Prices if Shows Were Combined

To the Editor:

Referring to your editorial in reference to the possibility of combining the conventions and machinery exhibits of the National Sand and Gravel Association and the National Crushed Stone Association, it seems a pity that two such large associations, having the same interests and selling field, can not see their way clear to getting together and making it to their interest to meet at the same time and interchange ideas, which is always a benefit to both in the long run. Naturally, the more harmony there is between the two associations, the more their field will enlarge. The few points that have been "bones of contention" between the two associations could be taken up jointly, and the whole matter threshed out to their advantage and the public good.

We, from a manufacturer's standpoint, would welcome such an arrangement, as these separate conventions have always taken our salesmen out of their territories at an inopportune time for the greater part of the month of January when they should be out soliciting business. If the two were combined, it would cut this time in halves, and there is no doubt in our mind that the machinery equipment and other accessories shown to both industries could be reduced and lower prices quoted, as the separate conventions cost the manufacturer a great deal of money. The reasons in its favor are so numerous that we hope the two conventions will be consolidated and are quite positive it will not only enlarge the field but prevent price-cutting and, to a certain extent, reduce costs to the operators.

MANAGANESE STEEL FORGE CO.
Philadelphia, Pa. L. W. Jones, *Pres.*

Says Plan Would Insure Bigger, Better Meetings

To the Editor:

We have read with interest your editorial under the title "Should the Big Associations Merge?" We are heartily in accord with the subject matter of your editorial and particularly wish to give our approval to your suggestion that the sand-and-gravel concerns and crushed-stone producers plan to hold their annual exhibitions at one and the same time. This would undoubtedly lead to larger and more successful exhibitions and thus be of more benefit to all producers of sand and gravel and crushed stone. At the same time equipment manufacturers would be highly encouraged to lend their full support every year due to the economy which would be effected by the merger and due to increased results and attendance to which they could look forward. You have our coöperation.

LINN MFG. CO.
Morris, N. Y. M. N. Bridges, *Asst. Sales Mgr.*

In Favor of Reduction in Number of Exhibits

To the Editor:

We have read the editorial, "Should the Big Associations Merge?" as printed in PIT AND QUARRY of February 11, 1931. Although we do not care to be quoted, we certainly are in favor of a reduction in the number of exhibits in which we are called upon to participate. We are pleased to note that such a movement is being sponsored by your publication.

Wilmington, Del. J. H. S.

Include Road Show, Too, Eastern Producer Urges

To the Editor:

I think the idea of having the sand-and-gravel and crushed-stone producers hold their annual conventions concurrently is a splendid idea. Couldn't this idea be carried out a step further and include the road show also?

J. F. FITZPATRICK CO.
Worcester, Mass. O. M. Dickinson.

Declares Movement Has Its Sympathetic Support

To the Editor:

Although our company has no exhibit in the annual shows to which you refer in your editorial, "Should the Big Associations Merge?", nevertheless, we feel very strongly that the many exhibits which are held in this country are an unwarranted burden upon industry and that the duplication of effort also decreases the value of these exhibits. Any movement which would tend to consolidate effort would have our sympathetic support.

WESTERN PRECIPITATION CO.
Los Angeles, Cal. Walter A. Schmidt, *Gen. Mgr.*

Too Many Shows Compel This Firm to "Pass Up"

To the Editor:

Our experience as manufacturers of equipment that goes to the quarry trade has been that the expense involved absolutely prohibits our taking in the numerous conventions connected with the industry. If it were possible to merge all the various associations, it would make an exhibition on the part of the different machinery firms well worth while. Under conditions as they now exist, we are merely compelled to "pass up."

BROOKVILLE LOCOMOTIVE CO.
Brookville, Pa. P. B. Eiseman, *Mgr.*

Steel Company Executive Predicts Vast Benefits

To the Editor:

We have read your editorial relative to the merging of the two trade associations in which we hold associate memberships. It is our opinion that every one concerned will be greatly benefited if a consolidation of these associations can be satisfactorily arranged.

KENSINGTON STEEL CO.
Chicago, Ill. Kenneth Jansen, *Vice-Pres.*

Sees Marked Advantages for Both Associations

To the Editor:

It seems to me, from an exhibitor's standpoint, that there would be considerable economy in having the two associations meet together, as suggested in your editorial, "Should the Big Associations Merge?" I feel quite sure that it would be to the advantage of the members of both associations to have the meetings together, in that the exhibitors would feel justified in putting on one good exhibit instead of two inferior ones.

MARTIN IRON WORKS OF ILLINOIS, INC.
Rockford, Ill. E. F. Sewell, *Ch. Engr.*

Operating Methods and Costs of Gravel Produced at a Wisconsin Plant*

By F. A. BINGHAM
General Manager, Northern Gravel Co., West Bend, Wis.

THE development of the gravel deposits in southeastern Wisconsin, other than those in the vicinity of Beloit and Janesville, dates back about twenty years and probably first centered in a commercial way about Waukesha, which is approximately fourteen miles due west of Milwaukee. The development has been rapid for the past fifteen years, due to the construction of concrete roads and the increasing use of concrete for all sorts of structural work.

The principal sand and gravel deposits occur in a glacial moraine beginning a little south of Green Bay and extending about one hundred miles due south, tapering out in the vicinity of Burlington. The size of the moraine varies but it is comparatively narrow, being probably not over five miles in width at the widest part. The moraine at points reaches a height of over one hundred feet. In locations where the height is great there is almost always a high percentage of large rock carried in the deposit. The material in the main section or the hills of the moraine is of excellent quality but, on the edges of the moraine where the deposits go below the fields, most of the material is rather badly contaminated with clay.

Practically all the deposits are worked above water-line so there is little evidence as to the depth of gravel below water-line but it is probably not great as limestone frequently comes to the surface, especially along the area south of Fond du Lac.

The deposit of the Northern Gravel Co. is north of Barton which is about midway of the length of the moraine. It is a large hill varying from seventy to one-hundred feet in height, approximately 3,000 feet in width at the base, and lying almost due north and south. The hill has been opened by steam-shovel work for a distance of about one-half mile and is comparatively uniform in composition and the relative proportion of sand and gravel carried.

The overburden averages about two feet in thickness and ordinarily consists of black sandy loam, above red clay in the low spots. Some of the low spots are of considerable depth and, in places, five to six feet of red clay have been encountered.

In size the material varies from sand up to boulders, most of which are smaller than eighteen inches in diameter, although rocks up to eight feet in length, two feet in thickness and three to four feet in width are encountered. The gravel is mainly of hard limestone formation but there is much granite, quartzite and some trap. The proportions of gravel in the deposit run uniform—taking the deposit as a whole—and about two parts of gravel are produced for each part of sand.

Stripping is accomplished by a Bucyrus 20-B revolving shovel on crawlers, this machine being equipped with both shovel boom and drag-line boom, the two booms being shifted from time to time as the nature of the moraine changes. The overburden is hauled from the above machine to a spoil dump in 5-cu. yd. dump trucks.

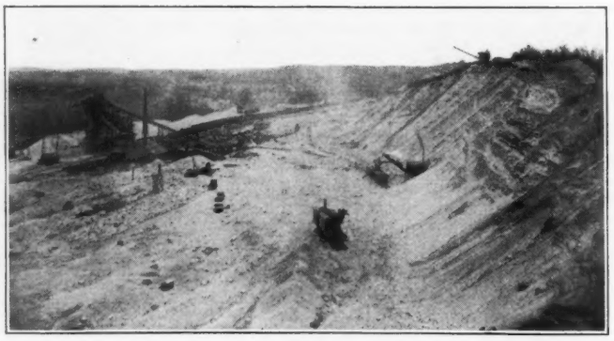
Loading is done by a Bucyrus 50-B revolving shovel mounted on crawlers and the bank, as a rule, caves freely; but, because of its height, one man equipped with a long spike-pointed pole is generally kept about the shovel to "tease" the bank, largely as a safety measure.

The raw material is conveyed to the plant in 7-cu. yd. side-dump cars running on standard-gauge track and hauled by Milwaukee 11-ton gasoline locomotives. Both the shovels are steam operated.

On arrival at the plant, the dump cars discharge over an inclined grizzly having about 4-in. openings, the oversize running by gravity to an Allis-Chalmers No. 8 Gates crusher which reduces the same to about 3½-in. in size. The undersize from the grizzly falls to a bin from which the material is fed to a 30-in. inclined belt conveyor by a reciprocating feeder and, as the No. 8 crusher sets opposite this feeder, its product joins that of the feeder on the 30-in. belt. This belt, which is 250 ft. long and about 18 deg. from the horizontal, delivers to an equalizing bin leading to the washing plant.

At the top of the washing plant this main conveyor discharges to an inclined grizzly having about 2½-in. openings to keep the large rock from reaching the revolving screens. The oversize from this grizzly flows through an inclined chute to the feeding bins of the secondary crushers. The undersize meets a stream of about 1,500 gal. per min. of fresh water in the preliminary washing box under the grizzly and flows into the first two washing and sizing screens.

All washing and sizing screens are of the



Stripping and loading operations. Plant at left.

* Paper read Jan. 27, 1931, National Sand and Gravel Assn.

Stephens-Adamson Gilbert conical type, the first two screens being 48 in. in diam. at the small end, 5 ft. 6 in. in length, and equipped ordinarily with 2½-in. round perforations. The oversize from the first row of screens flows by gravity to the feeding bin of the secondary reduction crushers.

The secondary reduction or finishing is by two No. 5 Gates crushers set to make about a 1¾-in. product which is discharged onto a 16-in. belt conveyor and is delivered into the main feeding hopper under the primary grizzly, where it mixes with the raw feed and is returned to the head of the plant.

The washing screens in the second row are each 36 in. in width by 36 in. in length and are equipped ordinarily with 1½-in. round perforations. The rejections of these screens form the largest size of gravel ordinarily produced. The undersize from the second row of screens flows to a third row of screens which are equipped ordinarily with 1-in. round perforations. The rejections of these screens form the second largest size of gravel produced.

The undersize from the third row flows to a fourth row of screens, each 36 in. wide, 36 in. long

Steam-operated drag-line stripping overburden.

and equipped ordinarily with ½-in. round perforations. These screens carry outer jackets which are equipped ordinarily with 5/16-in. round perforations, so these screens produce two gravel products, the first ranging from 1-in. to ½-in. in size and the second from ½-in. to 5/16-in. in size, stored in separate bins.

The undersize from the final row of screens flows to two drag-chain sand-dewatering boxes which are unusually long—about 22-ft. centers. The clean, dry sand is stored in its own bin. The water rejected from the sand boxes flows to a spill pond and is not re-used.

A recovery of approximately 95 per cent is realized: that is, the very fine sand and small amount of loam washed from the gravel amount to about 5 per cent of the total feed to the plant.

The storage bins of the plant are directly below the screens and have a total capacity of about one thousand tons. Railroad cars and trucks are loaded for shipment by means of side-loading spouts on the bins controlled by quadrant gates and the various sizes of materials are carefully measured to conform with the specifications for the different work for which they are used.

Steam shovel loading cars in the pit.

The washing plant and crushers are electrically driven by 3-phase, 60-cycle motors, all larger than 30-hp., operating at 2,300 volts. Power is purchased from the Wisconsin Public Utility Co. at approximately three cents per kilowatt-hour.

The maximum power demand of the plant, including the pump which furnishes the washing water, is about 160 kw., and 0.75 kw. is used per ton of finished sand and gravel produced.

An excellent supply of water has been made available by digging a lake adjacent to the washing plant. Nothing but clear fresh water from this lake is employed in the washing operation. An electrically-driven centrifugal pump, discharging through a 10-in. pipe-line to the head of the washing plant, delivers about 1,500 gal. of water per min. to the head of the plant, where it is discharged into the screens at a pressure of about 50 lb. per sq. in.

Storage for approximately sixty gondola cars is provided by the trackage south of the plant. This trackage is divided into four lines so that solid-bottom and hopper-bottom cars may be kept separately. The fourth track parallels the stock-pile. A gasoline locomotive is provided for handling cars on the switch tracks and moving them past the washing plant for loading.

Close to 100,000 tons of finished material is regularly carried in stock, the material being transported from the washing plant to the stock-piles in gondola cars hauled by the switching locomotive. The material is unloaded into the piles with a 30-ton railroad-type locomotive-crane having a 55-ft. boom and a 1½-cu. yd. clam-shell bucket. The various sizes of sand and gravel are kept in different piles. The total length of the storage system is close to 1,500 ft.

Material is loaded from the stock-piles for shipment by the above-mentioned locomotive crane and shipments are made during every month of the year. The storage system permits the operation of the plant almost independently of market demands and the filling of orders almost independently of the plant's ability to produce.

The capacity of the washing plant is approximately 250 tons of finished material per hour, or from 40 to 45 railroad carloads of material per 10-hr. day. Operations usually start in the spring on an 8-hr.-per-day schedule, which is stepped up, as the

demand grows, and sometimes runs to a 13-hr. or 14-hr. schedule. Generally speaking, we are able to hold the operations down to a 10-hr.-per-day schedule, even during maximum-demand periods, through shipments from the storage piles.

From eighteen to twenty men are required to operate the plant and the pit. The rates for labor are about the same as prevail throughout the Wisconsin district, starting with 45 to 50 cents per hour for common labor.

All employees, with the exception of the superintendent, plant manager and office help, work at a daily wage. The key men are kept twelve months of the year and employed during the winter months making repairs.

All operations and sales are under the direct charge of the general manager, whose office is located at the plant and who reports to the president. Operations are under the immediate charge of the plant manager, as are all shipments. The maintenance of the plant and detail operations are under the direction of the plant superintendent.

Advantage is taken of all safety measures and first-aid recommendations of the U. S. Bureau of Mines and the State of Wisconsin departments. All first-aid supplies and apparatus recommended are kept at the plant and skilled physicians' and surgeons' services are provided at the town of West Bend, about one and one-half miles distant, where there is also a very modern hospital.

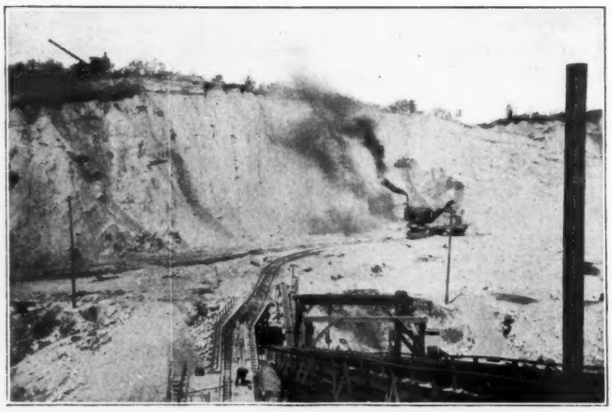
All machinery is carefully guarded in accordance with the recommendations of the inspectors of the Wisconsin Compensation Board. Safety-first signs are posted all over the works and a bulletin board is maintained for the display of posters urging the men to be careful. The accident rate is very low—in fact, no lost-time accidents were experienced during the past year.

The weather in southeastern Wisconsin permits operation of the washing plant usually from about April 15 until November 15, a period of about seven months, but volume of business usually restricts the operations to about six months.

The cost of producing and marketing washed sand and gravel at the above plant is approximately 50 cents per ton, this cost being divided as follows:

	Cents per ton	Per cent
Labor	15	30
Electric power and fuel	5	10
Repairs and maintenance	5	10
Supplies such as oil, waste, etc	2	4
Supervision	3	6
Direct production cost	30	60
Sales expense	5	10
Depreciation	7	14
Depletion	1	2
Liability and fire insurance	1	2
Local taxes	1	2
Plant office and supplies	1	2
Advertising	1	2
Executive officers' salaries and expenses	3	6
Total cost	50	100

It will be noted that the direct cost of manufacturing washed sand and gravel—labor, power, repairs, supplies and supervision of plant operation—constitute 30 cents, or 60 per cent of the total cost. To this must be added 20 cents per ton to cover the cost of selling, depreciation and other items.

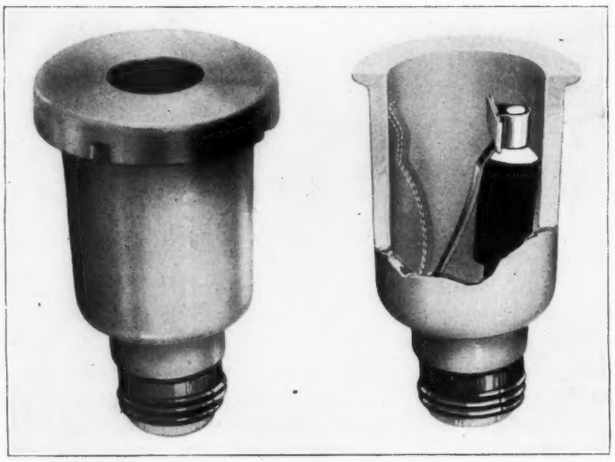


View of the pit from the top of the plant.

The Selection of Electric Motors

(*Continued from page 50*)

ing indicating the maximum rating of fuse with which they can be used. If the fuses in the line exceed this rating, it is necessary to add a set of fuses which will come within this rating to provide short circuit protection.



Time-element protective plug for induction motors.

The next point to be considered is the selection of wire between the mains and the motor. A squirrel-cage induction motor draws a large current during starting. This current decreases as the motor comes up to full speed, but the decrease is not rapid until the motors have increased in speed to approximately 60 per cent of full-load speed. As the fuse or overload relay setting is dependent not only on the current but also on the time, it can be seen that, on a load requiring heavy starting duty, the motor will not accelerate as quickly as one having a light starting duty. Therefore, on the former the large current will last for a longer period, necessitating a larger fuse than on the same motor handling a load having a light starting duty. This, in turn, means that a larger size of conductor must be used.

A Comparison of Cement-Plant Practice in America and Great Britain

By HAL GUTTERIDGE

IF we are to get a true perspective of the development of the Portland-cement industry in the United States, Canada, and the United Kingdom, we should first consider the influences which have affected its growth.

The most important influence imposed by Nature on the development of methods of making Portland cement is the disposition of the raw materials. This has exercised a definite effect on the choice of the process by which cement is made, that is, the choice of the "wet" or the "dry" process.

The accompanying article is reprinted by permission, from the November, 1930, issue of Cement and Cement Manufacture, *published in England, and is the first of seven sections which Mr. Gutteridge prepared after a personal tour of the cement plants in the United States and Canada and in which he compares the American and Canadian practices with those in the United Kingdom.*

In the United Kingdom, all the early Portland cement was made on the Thames and Medway, where the raw materials, chalk, and alluvial mud were found in close proximity. The comparatively high percentage of water existing in these materials in their natural state entirely excluded the use of any but the wet or thick slurry process, and this process was adopted for all plants in England at that time.

In the United States the reverse was the case, for the early cement was made from an argillaceous limestone rock called "cement rock," found in the Lehigh Valley district of Pennsylvania. This rock, as quarried, has a very small amount of moisture compared with chalk and alluvial mud. In those days the cement rock was the only raw material used, as it contained approximately the correct proportions of calcareous and argillaceous matter required for Portland cement. This material indicated the dry process as the most economical, judged by the standards and knowledge then available, and the dry process was generally adopted in that country.

With the great increase in demand for cement and the necessary distribution of plants all over the United States, hard limestone has superseded the use of "cement rock," and is now the most widely-used raw material. With the long experience of the dry process, that process was applied to the new materials, but the wet process gradually gained ground till, in 1927, of 153 plants, 77½ were employing the wet process, and 75½ the dry process. The greater quantity of cement was, however, produced by the dry process for, in that year, 66 per cent of the total of all cement produced in the United States was made on the dry process, and the remaining 34 per cent on the wet process. In the United States there is a steady trend towards the wet process, for in 1928 the number of plants was 80½ on wet and 74½ on dry process, and the percentage of the total quantity of cement produced was 61.9 per cent on dry and 38.1 per cent on wet process. Further, all the four new plants installed in 1928, and producing four million barrels of cement a year, are wet-process plants.

In the United Kingdom, on the other hand, although most mills are using chalk as the calcareous material, there is a large number using hard limestone, but in every case the wet process is employed.

Canada has a most interesting history in connection with the results obtained from the choice of processes. The first Portland cement was produced in Canada in 1889 by B. Wright & Sons, of Hull, Quebec, and about the same time two other plants were erected in Ontario and one in Quebec. Between 1898 and 1905 there was a boom in making Portland cement from the marl found in many of the small lakes in Ontario, and eleven companies built and equipped works to make use of this product by the wet process. By 1922 all these companies had ceased to manufacture, and no cement was being made from marl.

After the marl boom, the dry process of manufacturing cement from rock began to be developed from 1905 onwards in various parts of the country; among these it is interesting to note that, in 1912, a plant at Marlborough, Alberta, was built, using marl as its raw material on the wet process, but this plant in 1917 changed over to the dry process.

In 1909 the Canada Cement Co., Ltd., was formed to take over plants in different parts of the country, and brought about a stabilization of the cement industry in Canada. The plants taken over were brought to a high standard of efficiency, and the company fixed and maintained prices and regularized distribution. In 1927, of the total of thirteen plants operating, eleven were using the dry process and two the wet process. In June, 1930, of the twelve plants operating, eight were using the dry process and four the wet process. It is to be noted, however, that the Montreal East No. 1 plant of the Canada Cement Co., with a capacity of three million barrels per annum, and which is now adding equipment to increase its capacity, is changing over from the dry to the wet process. When this change takes

place the number of plants operating on the dry process will be seven and on wet five. The capacities of dry to wet will change from a ratio of 28 to 13 to a ratio of 18 to 23.

Another development due to the influence of the disposition of raw materials imposed by Nature, is the use of waste-heat boilers. With the dry process the average temperature of the exit gases is about 1,200 deg. F. compared with 600 deg. F. to 700 deg. F. with the wet process when the slurry is fed into the kiln by gravitation and with a water content of 35 to 40 per cent. With "atomized" or "spray fed" slurry the exit temperature is considerably less, being in the neighborhood of 300 deg. F. With the dry process, therefore, a large quantity of utilizable heat is available for conversion into useful work. A small portion of this was being used for drying the raw materials previous to their being ground, but this left the major portion still unused. This, in the search for economy, led to the development of the waste-heat boiler.

In the United States the influences imposed by Nature can be easily traced from raw materials through the dry process to waste-heat boilers. The number of waste-heat boiler installations increased from eight in 1919 to thirty-five in 1924, and in 1929 there were fifty-seven installations, comprising about 194 boilers. Therefore in that country in 1929 approximately one of every three cement plants had a waste-heat boiler installation.

In the United Kingdom, with all plants operating on the wet process, the position is quite the reverse. The practice has always been, and still is, to keep the plant as a whole as simple as possible, and to use every endeavor to reduce the temperature of the exit gases as far as possible instead of maintaining the temperature at a level necessary to suit the economical operation of the boiler or even artificially increasing the quantity of heat so that the area of heating surface of the boiler may be kept within reasonable limits. The position today in the United Kingdom is that there are no waste-heat boilers installed in any of the cement plants, and, further, the trend is towards longer kilns and the introduction and use of the "spray" feed to lower the exit-gas temperature.

In the United States, due to the early specialized experience with comparatively dry raw materials, the use of the dry process persisted when other raw materials were used, until within recent years a very gradual but quite definite change has taken place in the adoption of the wet process, with the result that at the present time the majority of cement plants in that country are using the wet process. The employment of the waste-heat boiler can also be traced to the influence imposed by Nature, for with the use of the dry process, and the consequent higher flue-gas temperature obtaining, the use of waste heat was a natural development.

In the United Kingdom, on the other hand, the use of chalk and clay in all the early plants led to the employment of the wet process, and in this country that process is considered better even with hard limestone as the principal raw material.

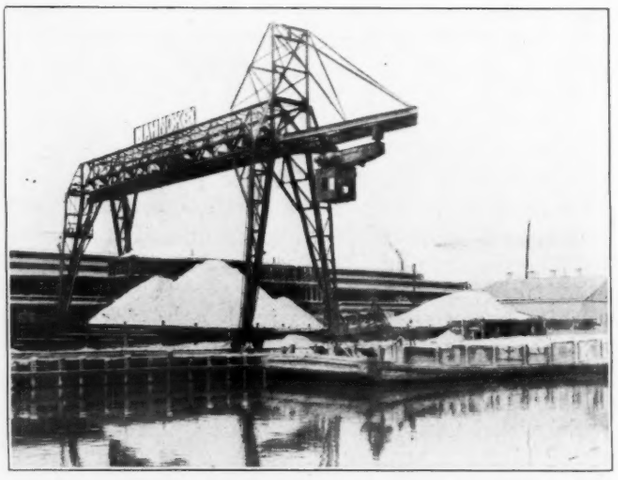
In contrast to both the United States and the United Kingdom, Canada has had a very mixed experience in the use of the two processes. Starting with the dry process, it swung right over to the wet process, and then back to the dry process. In common with the United States, there has been, in the last few years, a definite trend towards the wet process, and at the present time there are eight plants operating on dry process and four on wet process. By the end of 1930, with the conversion of the Montreal Plant No. 1 from dry to wet process, the plants operating on dry process will be seven and on wet process five. The quantity of cement made now by the dry process is approximately twice as much as by the wet process, but when this Montreal plant changes over, the position will be reversed, in that, for every 18 barrels made by the dry process, 23 barrels will be made by wet process.

Contrasting this with the United States, it is interesting to find that although there are a less number of plants on wet process in Canada, a greater quantity of cement will, by the end of this year, be produced by that process, while in the United States, with a preponderance of plants on wet process, the greater quantity is produced by dry process.

Gantry Crane Handles Shells, Gravel and Sand at Southern Plant

Jahncke Service, Inc., of New Orleans, does a large business in the production and sale of sand, gravel, and oyster shells. Sand and gravel are produced at two subsidiary plants, the Roseland Gravel Co. and the Brookhaven Gravel Co.

At New Orleans, the firm maintains a wharf and distributing plant for these three materials, the shells coming from the beds in the Gulf, being brought in by barge. In order to handle the materials speedily and economically, the company has installed a gantry crane of the monorail type. The crane, which was supplied by the Shepard-Niles Crane & Hoist Corp. of Montour Falls, N. Y., is equipped with a grab bucket and handles the material from barges to stock-piles and from the piles to cars for shipment.



Gantry crane at the Jahncke plant.

Cranes placing the broken rock in position on the dam.

Four Quarries Developed in California to Produce Rock for Huge Dam

Rock-Filled Project at Salt Springs Requires 3,000,000 Cu. Yd. of Material

CONSTRUCTION work upon the Pacific Gas & Electric Co. Salt Springs water and power development in the upper reaches of the north fork of the Mokulumne River, near the border line of Alpine County, Cal., has been in full progress since the beginning of 1928. Work on the development started in the early summer of 1926. At that time, however, the dam site was almost inaccessible, for it lay several thousand feet below the Alpine highway running from Jackson into Nevada and there were no available means of transportation to the spot save a small road leaving the highway at a forest ranger's station some 37 miles out from Jackson, where the elevation is 6,500 ft. above sea level, and plunging down the precipitous slope a distance of five miles to a ranch. This road the company's engineers used at first, reconstructing it and carrrying it down to the Bear River crossing, a drop of 3,000 ft. in all from the highway. From that point the road was carried along the north bank of the river to the dam site, a distance of about 13 miles. This, however, did not provide all-the-year-round transportation. A second and more substantial means of approach was carried out in the construction of a broad, rock-surfaced road taking off the highway at a point 20 miles out from Jackson where the elevation is only 3,300 feet. This road, of permanent construction, winds its way to the Bear River crossing by way of Tiger Creek, passing within four miles of the site of the Tiger Creek power-house that will be the major power development of the new project.

All this took time. The road was not available for use until the winter of 1927. Then came the work of erecting a permanent construction camp at Dead Man's Flat, near the power house. This was completed in the early spring of 1928, when the real construction work started. This development starts at a point in a gorge about fifty miles upstream from the company's 26,000-hp. plant at Electra, which lies on the north bank of the stream, some eight miles from Jackson, the seat of Amador County. It takes its name from Salt Springs Lake, a picturesque body of water fed by subterranean springs and nestling among lofty eminences in a gorge of the river some six miles above the storage project. The work is planned to provide increased power and water facilities for the Electra system.

The wide gorge at this spot in the river is being spanned with a structure which, when completed, will be 330 ft. high and 1,300 ft. in crest length, and will measure 800 ft. from upstream to downstream toe.

This project includes also the construction of a water conduit from the tunnel intake of the dam a distance, in round numbers, of twenty-five miles, to the point where Tiger Creek flows into the Mokelumne, and where a small dam across the river marks the intake of the Upper Standard canal, one of the two main feeders of the Electra system; and the erection of a hydro-electric plant of 75,000-hp.-capacity on the north bank of the river at the point of its junction with Tiger Creek, where there is a drop of 1,200 ft. from the line of the water conduit from Salt Springs.

Railroad tracks extend along the edge of the fill, permitting cars to dump the material in the desired position.

The major interest in the entire project is centered upon the Salt Springs dam, the largest rock-fill dam ever built, the keystone of a $25,000,000 hydro-electric development of The Pacific Gas & Electric Co. Built into granite cliffs that line the Calaveras County and the Amador County sides of the canyon, the dam will create a reservoir four miles in length with a storage capacity of 130,000,000 acre-feet of water. The work of blasting off great sections of solid rock to provide loose material and of loading this rock with power shovels into large steel cars drawn by electric locomotives and Caterpillar tractor-drawn Athey trailers has gone ahead on day and night shifts without interruption for nearly three years.

A temporary diversion dam was constructed at the upstream end of the site, and the water of the Mokelumne River was diverted into a 1,200-ft. tunnel, 19 ft. in diam., bored through solid rock on the north side of the stream. Next in order was the construction of a concrete cut-off wall at the upstream face of the dam. This, with about fifteen feet of permanent structure above it, protected the river bottom from the winter storms. In the meantime, bedrock at the dam-site was cleared, exposed and placed in order for the coming work. It was not until all this had been accomplished that a quarry on the north side of the stream was opened up and the work of pouring rock into the dam started.

The 3,000,000 cu. yd. of loose rock required for the construction of the dam is obtained from three quarries located on the north side of the canyon and a fourth located on the south side. The excavation of the fourth quarry, which is known as No. 4, provides a cut which is to be used as the spillway.

The rock from the three north quarries is handled by two 4-cu. yd. electric shovels and loaded on 50-ton Clark dump-cars which are drawn by 20-ton storage-battery locomotives operating over broad-gauge tracks. A Nordberg machine is used in shifting the tracks. Eight 8-ton narrow-gauge storage-battery locomotives were converted by the Pacific Gas & Electric Co. into four 20-ton, standard-gauge units, each unit hauling two of the 50-ton Clark cars on each trip.

The main quarry on the north side of the canyon, known as No. 3, is approximately 1,000 feet in length and supplied approximately 1,500,000 cu. yd. of loose rock, this having gone into the lower half of the 330-ft. dam. The haul of rock from this quarry was approximately 2,000 ft. The rock obtained from quarries No. 1 and No. 2 was used in building the third quarter of the dam, and that obtained from quarry No. 3 is used in building the top quarter.

On Nov. 5, 1929, approximately 350,000 cu. yd. of loose granite were brought down with a single shot that consumed 116,250 lb. of Hercules explosives and Cordeau-Bickford detonating fuse. In this blast, 44 well-drill holes, 6 in. in diam., approximately 22½ ft. apart, 45 ft. back from the face, and varying in depth from 139 ft. to 174 ft., were loaded with 40-per cent Gelatin Extra 3-in. by 8-in. cartridges and Special No. 1 dynamite packed in bags. The average main charge consisted of approximately 1,000 lb., while deck loads averaged about 1,500 lb. Pockets were about 10 ft. deep. Stemming av-

Tractor and dump wagon working on a promontory of the dam.

A recent view of the Salt Springs dam as it neared completion.

eraged 30 ft. Because water conditions varied, there was no fixed proportions of the gelatin and Special No. 1 in the main charge. An average load was 600 lb. of 40-per cent Gelatin Extra and 400 lb. of Special No. 1. However, in some holes as much as 1,350 lb. of Gelatin was used while in others only 100 lb. was used.

To obtain good toe breakage, 99 toe-holes, on about 8- to 10-ft. centers, were drilled into the face of the quarry to a depth of 24 ft. and loaded with 40-per cent Gelatine Extra.

No more rock is being taken from this quarry as the dam has reached the base of the quarry.

Due to the height of this rock-fill dam, great care was necessary in determining conservative side slopes and to allow for settlement. The upstream face has an average slope of 1.3 horizontal to 1 vertical. The downstream face has a slope of 1.4 horizontal to 1 vertical. As the top width is 15 ft., these slopes give the base width, measured along the axis of the river bed, of about 900 ft. The dam will contain approximately 2,900 cu. yd. of rock, of which 220,000 cu. yd. are required for a layer of derrick-placed rock, of a uniform thickness of 15 ft. against the upstream face. This, in turn, is being covered with a flexible, reinforced concrete facing one foot thick at the top and increasing to three feet at the bottom where it ties into the concrete cut-off wall.

In plan, the dam is arched upstream, the magnitude of the warping—which is 6½ ft. at the crest and decreases with the depth—being determined by the estimated settlement due to the weight of the fill combined with that due to water pressure, and the provision that the dam is to retain a slight convexity after final settlement has taken place. Tension cracks will thus be minimized in the concrete facing. In addition, the design is such that a vertical section through the face of the dam parallel to the stream-bed will remain concave after settlement has occurred. Hence the lateral thrust due to the weight of the concrete will be against the rock backing at all times and the tendency to buckling (which would result if the section became convex) is avoided.

To give sufficient flexibility, the concrete facing is divided into independent squares approximately 60 ft. on a side. The edges of these slabs rest on concrete supports formed by filling depressions or grooves, purposely left in the face of the placed rock, with concrete. To simplify construction, the sides of the squares are straight lines, the four corners being accurately set, using computed offsets from the theoretical slope line. The exterior surface of concrete filling the grooves is painted with hot asphalt before the slabs are poured, as is, also, the upper edge of each slab before the next one above is placed. The vertical edges of the squares are separated one inch and the space filled with an asphalt compound to provide a take-up for the shortening of face resulting from settlement of the rock-fill.

Two layers of 1-in. steel bars at 9-in. centers are used to reinforce the lowest portion of the facing.

The amount of reinforcing is gradually reduced to a single layer of 1-in. square bars at the crest of the dam spaced 13 in. in both directions. The joints between panels are made water-tight by soft copper seals embedded in the concrete.

The cut-off is a concrete wall 6 ft. thick extending from the base of the dam 6 to 20 ft. into good rock. Where the height of the dam exceeds 200 ft., grout holes of 2-in. diam., 50 ft. deep, and spaced 6 ft. apart, were drilled along the bottom of the cut-off trench. At the two banks, where the height of the dam is less than 200 ft., the grout holes are spaced at 10-ft. centers and the depth is gradually reduced to a minimum of 25 ft. at the top of the dam.

The entire base of the derrick-placed rock section is laid up in concrete mortar to a height of 10 ft. to give a more gradual transition from the solid bedrock to the loose fill. This is calculated to minimize the tendency of the concrete slab to crack

A quarry blast. The size of the face may be visualized by comparing it with the shovel in the lower right hand corner.

along the line of junction of the facing and the cut-off wall.

Building the 15-ft. layer of derrick-placed material, containing a total of 220,000 cu. yd., consists essentially of laying down large rock with the best possible contact to the adjacent rocks and of filling the intervening spaces with spalls and small stones. Electrically operated cranes (converted from full-swing power shovels mounted on crawler tracks with 35- to 40-ft. booms and front drum attachments) transfer rock from the loose fill to the placed section. Rock up to a maximum size of ten tons is handled by wire-rope slings.

Each crane unit moves ahead a distance of 200 to 300 ft. on a roughly leveled roadway on the top of the course being laid. On its return trip, a second course is laid above the roadway, using spalls removed from the roadbed to chink up spaces in the placed rock. Each of these courses is full width and 6 ft. in depth, making a 12-ft. lift constructed from each road level.

Each crane, working two shifts with a crew of six men, places approximately 3,000 cu. yd. a month, or 15,000 cu. yd. per month for the five units. Two units only were used in the beginning, increasing in number as the total length of roadway became greater.

An interval of several months elapses between the dumping of the loose fill and the building of the placed rock against its slope.

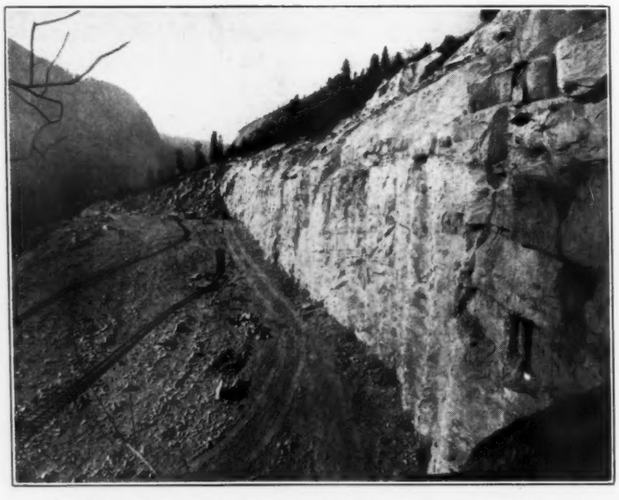
For the work of concrete-facing, a crushing and concreting plant was constructed on the left bank upstream from the spillway. Rock is quarried and crushed to a 2½-in. maximum size. Sand is obtained by passing crushed rock through a cone crusher.

Concrete is delivered along the face by 2-cu. yd. side-discharge cars hauled by a gasoline locomotive over a track constructed along the horizontal recesses of the placed rock. From the cars it is spouted by chutes directly into the cut-off wall and the 60-foot panels.

The dam construction is now more than 85 per cent completed.

During the past year, the Pacific Gas & Electric Co. has been constructing a concrete flume which will convey the water released from the dam about eighteen miles to the Tiger Creek power house. This flume is box-like in shape and is laid upon a bench prepared along the mountain sides. It is 14 ft. wide and 7 ft. deep inside. It will have a carrying capacity of 550 cu. ft. of water per second.

The bench upon which the flume rests is constructed in much the same manner as is any mountain highway, the excavating being done by small power shovels. After the bench has been prepared, concrete ties or sills are placed transversely at intervals of 4½ ft. to serve as a foundation for the forms and the reinforcing steel and as supports for a temporary timber runway over which materials and equipment are transported until the flume bot-



The face of one of the quarries where rock was obtained.

tom has been laid and has attained adequate strength to support the weight of the equipment.

After the concrete ties have been poured and their forms stripped, the bench is cleaned off so as to leave an even compact bearing surface upon which to pour the flume structure. The reinforcing

steel for the floor and side walls is then placed in position, the floor and wall bars being wired together as a self-supporting unit resting upon the concrete ties.

Following the installation of reinforcing steel, the temporary timber runway is built of heavy timber cross-ties covered with planking, all supported upon wooden blocks which rest upon the concrete ties previously described. This runway also carries steel rails along its outer edges, on which travel the heavy pieces of equipment which are used in setting the forms and placing the concrete. Outside and inside forms for the side walls consist of steel panels 5 ft. in width and weighing approximately 1,000 lb. to the set. They are designed for erection on the concrete ties and, being readily removable, are used repeatedly on successive sections of the work.

Shovel loading rock into tractor-drawn dump wagons.

For the placing and stripping of forms and pouring of concrete, unique designs of equipment have been employed, consisting of four so-called jumbos, one of which is used to set the forms, a second to place the concrete, a third to strip the forms from the finished concrete, and a fourth to hoist and turn the tractors which haul materials to the concrete mixer. These jumbos constitute a single concreting plant of which there are a total of four being used along the canal. Each jumbo is, in reality, a rectangular-shaped steel tower about 15 ft. high, the four legs of which are mounted on flanged wheels which travel on rails on the timber runway. These towers carry various mechanical devices, depending upon the purposes which they are to serve. All the jumbos are electrically operated and, with the exception of those used for stripping forms, they are self-propelled.

The form-setting jumbo, which is the first unit of each concreting plant, carries a derrick, mounted centrally on each side, and used to lift the heavy steel-form panels into place. The concrete jumbo carries a complete self-contained, concrete-mixing plant, including loading hopper, mixer, endless-conveyor belts, chutes and distributing hoppers which permit an efficient handling of the materials from the raw aggregates through the process of mixing and distributing the concrete in the walls and floor of the flume.

Concrete materials for the construction of the flume are distributed from four aggregate bins set on the bench so as to straddle the flume at positions located conveniently to the highway for the most economical hauling conditions. The hauling along the flume bench is by means of small pneumatic-tired dump-cars pulled by industrial tractors.

When the train reaches the concrete-placing machine, the tractor is cut loose and runs through the mixer jumbo and underneath the tractor hoisting jumbo where it is picked up, turned about and left suspended in the air. Each successive trailer is cut loose at the mixing jumbo and its load dumped into the hopper. When the hopper is in the air the empty trailer is shoved ahead through the mixing jumbo and beyond the tractor-hoisting jumbo.

It has been decided that the power generated at the Salt Springs plant shall be transmitted at 110,000 volts to the Tiger Creek power house, there to be stepped up to 220,000 volts for transmission by a double-circuit steel tower line to Electra and on through Stockton and the Livermore valley to the company's high-tension distributing station at Newark, at which point it will be merged in the Pacific Gas & Electric Co.'s power pool.

After a 56-ton shot which brought down nearly a half-million tons of rock.

Plant Superintendent Uses Dynamite to Cut Crusher Concave

Sometimes it seems desirable to decrease or to increase the discharge opening in a gyratory crusher at short notice. F. W. Herkel, superintendent, Material Service Corp., found it necessary to make such a change which would require a new concave from the factory of the crusher manufacturer. In this particular instance the manufacturer could not promise delivery inside of two weeks. This superintendent thereupon shut down the crusher, removed one section of concave, made his change therein, and had it reassembled within two hours.

His procedure consisted in drilling contiguous 5/8-in. holes in the back or unchilled side of the concave, along a straight line, as shown in the sketch herewith, and as deep as the drill could penetrate

(Continued on page 64)

New Technique in Welding Is Result of Years of Scientific Research

By KEITH B. LYDIARD
Babcock & Wilcox Co.

JUST a few years ago, as industrial history is measured, the available information on welding was presented only in the form of instructions covering manual operations for the workman. Welding was, at that time, a shop matter and little attention had been paid to the scientific aspects of the subject.

However, it was apparent to far-sighted students of power-plant practice that welding might, some day, prove superior to riveting in constructing boiler drums. Welding had been used extensively up to that time and the process was gaining favor, though it had never been used to any real extent in the construction of power boilers. It was apparent, therefore, that a truly scientific and fundamental study of welding would have to be undertaken by

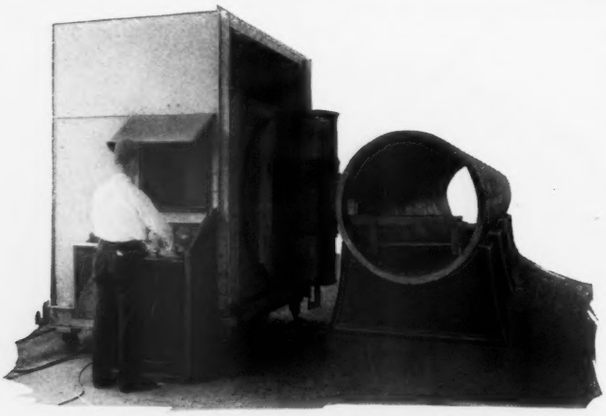


Fig. 1—A welded drum 30 ft. long with 2¼-in. walls set up for an X-ray test. The arrangement is such that photographs may be made of both longitudinal and circumferential seams.

the boiler maker who wished to pioneer in this development. So, about five years ago, Babcock & Wilcox research engineers started a research program which was to write at least another page into the history of welding.

During the course of this work, many interesting facts were discovered, the accuracy of many basic

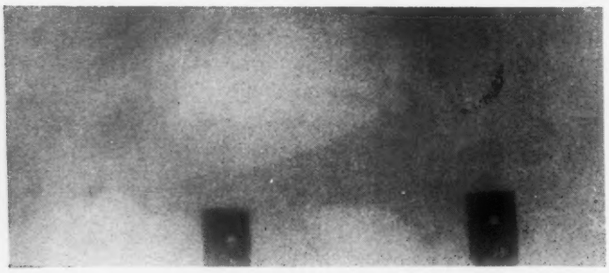


Fig. 2—X-ray photograph of a high-quality weld. The location of the weld can be detected only by a slight difference in the density of the print.

principles was verified, and a few rules that had been considered fundamental and basic were found to be quite in error. The complete story of this search, interesting though it is, has no place in an article such as this beyond a brief mention to show the background against which the investigation labored for five years.

The investigators finally evolved a technique which produces welds equal to or better than the welded plate itself in tensile strength, shock resist-

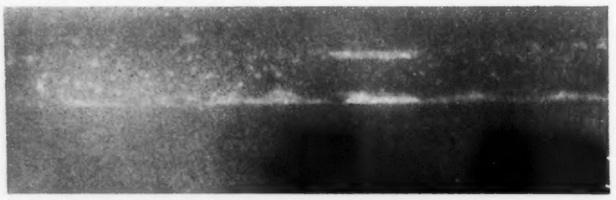


Fig. 3—An example of a poorly welded joint, the defects of which are shown in the X-ray photograph. The light lines represent a slag inclusion lying along the wall of the joint. Porosity is shown by the white specks.

ance, ductility, and in the ability to withstand repeated stresses. This process was not developed in one year. Five years were consumed in perfecting this process and, in this period, many difficulties had to be overcome.

They found that there are three primary conditions that must be met in the production of sound welds. The first is the elimination of defects in the weld metal itself—defects that result in porosity, blow-holes, brittleness, and coarse-grained structure. The second includes impurities in the weld

Fig. 4—This welded seam represents what might be termed a weld of fair quality. Porosity only is shown.

metal such as slag inclusions and oxides. The third is the failure of the process to actually weld two parts into one solid piece—incomplete fusion. In addition to developing a process that meets these conditions, a scientific method of testing was required to prove the quality of the weld. Both process and method of testing are easily understood.

Welding machines of special construction are used and the use of a coated electrode results in a protective covering of slag which prevents oxidation. Successive beads are laid one upon the other and each has the effect of annealing the one pre-

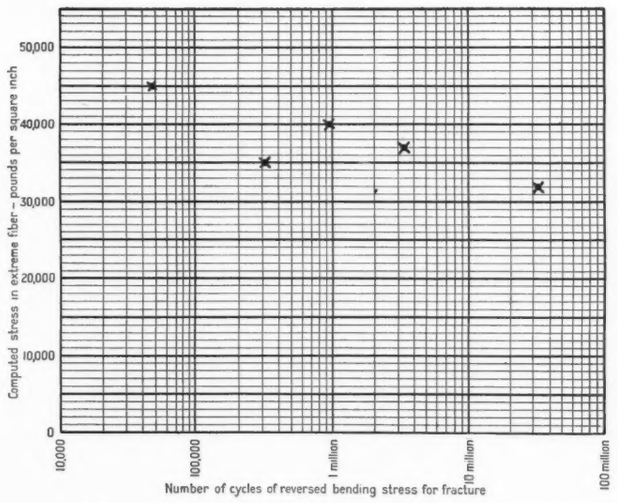


Fig. 5—Chart showing the results of laboratory tests conducted by Prof. H. F. Moore of the University of Illinois to determine the relation between the number of cycles of reversed-bending stress and stress magnitude for welded joints.

viously laid. The protective coating is removed after each bead is laid, presenting a bright clean deposit of completely fused weld metal in the channel.

X-ray photographs are taken of the entire welded joint. Welds are explored by a modern machine housed in a special cabinet designed especially for this work. Each photograph is 12 in. in length. With one machine 15 photographs per hour may be made. As the weld is covered from end to end, slag inclusions, air pockets, and defective fusion in the metal, if any such exist, may be readily detected. A study of Figs. 2, 3 and 4 show this point clearly.

Each drum, after welding is completed, is thoroughly stress-relieved by heating it, as a unit, to at least 1,100 deg. F., in a carefully controlled furnace. Is the weld able to withstand fatigue after the molecular readjustment has occurred? That it is amply able to do so has been definitely proved in many fatigue tests both on full-sized welded drums

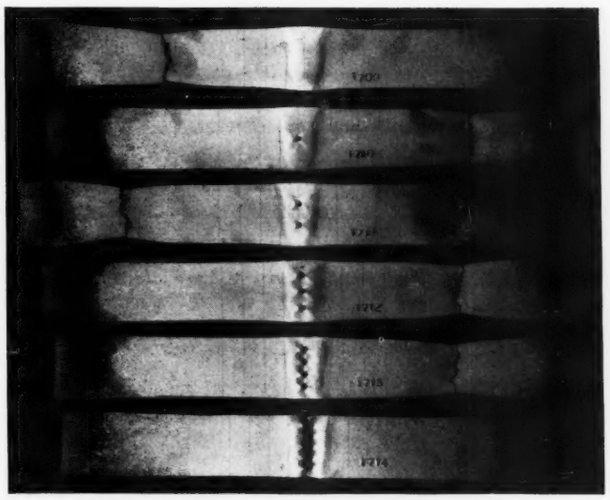


Fig. 6—Tensile test specimens. Six pieces taken from the same plate and across the same welded seam. The welds were progressively weakened until in Specimen 1714 five holes, representing a reduction in area of approximately 34 per cent, caused failure.

Weld Metal	Min.	Max.	Average	Plate
Ultimate tensile strength (*lb. per sq. in.*)	60,000	74,500	67,500	55,000 to 65,000
Yield point (*lb. per sq. in.*)	40,000	55,000	45,000	½ ult. str.

and on laboratory specimens. Specimens set in rotating-beam machines have been subjected to reversed stresses with similar tests made on boiler-plate steel for comparison. Fig. 5 shows the results of laboratory tests conducted by Prof. H. F. Moore of the University of Illinois to determine the relation between strength in weld and in plate 30,000 lb. per sq. in. and 28,000 lb. per sq. in., respectively.

The tensile test of a weld is perhaps the simplest and most easily understood of all studies or tests, and it is just as important as it is simple.

Hundreds of tension specimens have been cut across welded joints made by this process and, on test, the failure has always occurred in the plates,

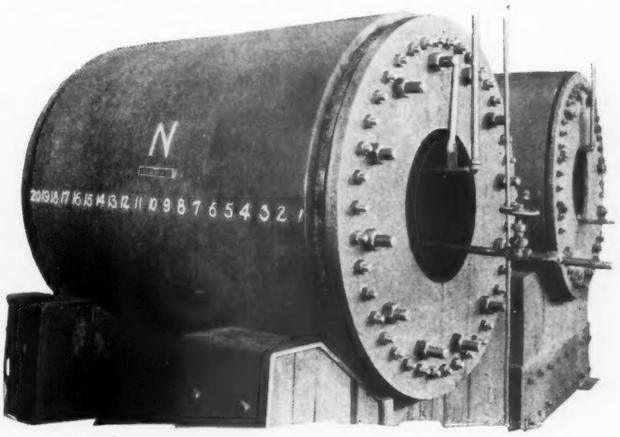


Fig. 7—Test shell arranged for repeated pressure test. The shell surrounds an inner shell leaving an annular space between the two. Packing and glands close the ends of this annular space.

even though the section through the weld is the same thickness as that of the plate. Failure has been made to occur in the weld by drilling holes in the weld metal until sufficiently weakened to break under tension. Note the photograph of test pieces in Fig. 6. Each specimen was cut from the same plate and across the same welded seam. The welds were progressively weakened by holes, but failure in the weld did not take place until five holes were drilled through the weld metal. As a result of tests made in this way, the actual tensile properties were obtained as shown in the table at the top of the page.

Another method of testing is to subject welded drums to repeated pressure applications far above the working pressures at which they will be used.

	Quality Weld Metal	Ordinary Arc-Weld Metal
Silicon.....	0.05 to 0.10 per cent	Nil
Sulphur.....	Less than 0.045 per cent	Less than 0.045 per cent
Phosphorus....	Less than 0.04 per cent	Less than 0.04 per cent
Manganese.....	0.03 to 0.60 per cent	Less than 0.20 per cent
Carbon.....	0.08 to 0.15 per cent	0.02 to 0.08 per cent
Nitrogen.....	Less than 0.02 per cent	0.10 to 0.14 per cent

One drum successively withstood 2,000,000 cycles of pressure variation from zero to one and one-half times working pressure—maximum fibre stress

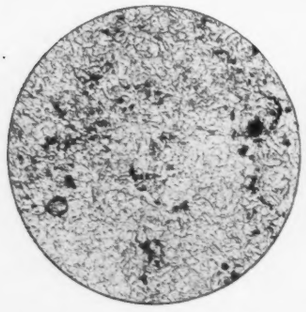


Fig. 8—Oxide inclusions (100 diameters). This specimen of weld metal is finely grained, but the dark areas show porosity and oxide inclusions which weaken the weld.

Fig. 9—Coarse grained (100 diameters). Photomicrograph of unsatisfactory weld metal. The grain structure is too coarse and its resistance to shock is very low.

across the welded joint approximately 16,500 lb. per square inch. Fig. 7 shows welded-drum sections undergoing repeated pressure tests.

The chemical composition of B. & W. weld metal as compared with ordinary arc-weld metal is interesting in that it shows the high-carbon and low-nitrogen content of a weld made by the Babcock & Wilcox technique.

The presence of voids or porosity in a weld may be detected from a study of the density of the weld metal. The following table illustrates the quality of this metal as indicated by the percentage of voids.

Metal	Samples tested (*per cent*)		
	Min.	Max.	Aver.
Firebox plate	7.80	7.85	7.82
Bare electrode weld metal	7.44	7.68	7.59
B. & W. weld metal	7.80	7.85	7.82

A macroscopic study reveals very important characteristics of the welded joint. The adjacent photographs illustrate the value of the macrographic studies.

The range of metals which can be welded by this technique includes not only tank steels and carbon steels of firebox quality, but the so-called stainless steels or chrome-nickel austenitic alloys, chrome-vanadium alloy steels and other structural steels can also be successfully welded. Copper, and the usual non-ferrous alloys can be welded or brazed.

This article describes some of the results obtained when this technique is used to weld carbon steel of firebox quality. The illustrations and data are limited to welds in this one metal for the sake of simplicity, although similar results can be secured from welds made in the other metals and alloys mentioned.

Fig. 10—Nitride needles (500 diameters). The magnification shows nitride needles which indicate this weld metal was not protected from the air during deposition.

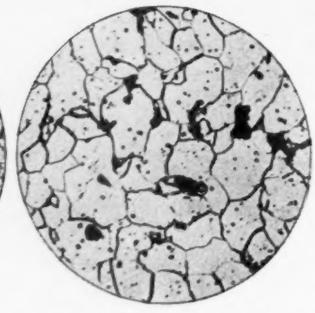
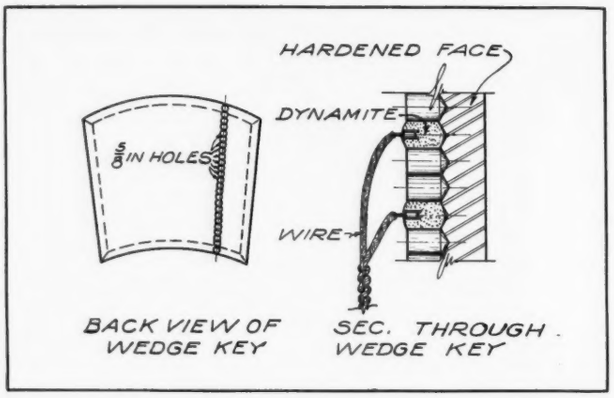


Fig. 11—High grade weld metal (500 diameters). At 500 diameters the photomicrograph of this quality weld metal shows no nitride needles or other physical defects.

Dynamite Cuts Crusher Concave

(*Continued from page 61*)

or to within about 1½ in. of the working surface. Every third or fourth hole being then loaded with a bit of dynamite and an electric cap, the resulting shot effected a straight fracture which required almost no chipping or grinding. Upon being re-



Mr. Herkel's method of cutting a crusher concave by "drilling and blasting."

placed in the crusher, this concave and its companions were set in place, as in usual practice, with zinc.

If the crusher opening were to be enlarged, a key could be made, by a similar procedure, from a spare concave and inserted between two of the regular concaves.

Standards on Commodities Approved by League of Nations

Following a request by the League of Nations, various countries have replied stating the formula which defines their "standards" by which the foreign buyer may be protected and assured merchandise of quality.

The list of such commodities is extensive as shown by the League report, which is a résumé of the replies to a questionnaire submitted to forty countries, and fills 145 folios. The subjects treated are, if not exhaustive, at least extensive, running from food stuffs, straw, soap and textiles to phosphates, precious metals, coal, potash, marble, sand and building materials.

In the final résumé the report hands a bouquet to the U. S. Bureau of Standards, particularly with respect to specifications and standards of materials used in the building and other trades, notably those having to do with cement products.

MEN OF THE INDUSTRY

The portrait printed on this page in each number of PIT AND QUARRY is selected without significance as to current events or the position of the individual in the industry.

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ARTHUR B. SHELBY
Vice-President and General Manager
Calaveras Cement Co.
San Francisco, Cal.

Coming Events

April 21-24. Toronto, Can. Annual meeting, Building Officials' Conference, King Edward Hotel. John W. Oehmann, sec., Washington, D. C.

April 29-30, 1931. Boston, Mass. Massachusetts safety conference. L. E. MacBrayne, mgr., Massachusetts Safety Council, 24 Branford Pl., Boston, Mass.

May 1, 1931. Rockford, Ill. Rock River Valley safety conference. J. H. Lee, sec., Rockford Industrial Safety Council, Rockford, Ill.

May 4, 1931. New York, N. Y. Thirteenth exposition of Chemical Industries, Grand Central Palace. International Exposition Co., managers, Grand Central Palace, New York.

May 4-9, 1931. Charlotte, N. C. Annual convention, U. S. Good Roads Assn.

May 8, 1931. Houston, Tex. Southwestern Regional safety conference. W. R. Moncure, mgr., Safety Dept., Chamber of Commerce, Houston, Tex.

May 11, 12, 1931. Cleveland, O. Annual convention, Cast Stone Institute, Hotel Cleveland. C. G. Walker, asst. sec., 33 W. Grand Ave., Chicago.

May 13, 14, 1931. West Baden Springs, Ind. Mid-year meeting, board of directors, National Sand & Gravel Assn., West Baden Springs Hotel. V. P. Ahearn, exec. sec., Washington, D. C.

May 14, 1931. St. Louis, Mo. Monthly meeting, St. Louis Quarrymen's Assn., Forest Park Hotel. E. J. McMahon, exec. sec., 4063 Forest Park Blvd., St. Louis, Mo.

May 15, 1931. Chicago, Ill. Meeting, board of directors, National Ready-Mixed Concrete Assn., Congress Hotel. V. P. Ahearn, exec. sec., Munsey Bldg., Washington, D. C.

May 15-16, 1931. Washington, D. C. Annual meetings, American Road Builders Assn. and its City Officials and County Highway Officials divisions. Suite 938, National Press Bldg. Chas. M. Upham, engineer-director, same address.

May 20, 1931. Fond du Lac, Wis. Fox River Valley safety conference. F. W. Hainer, sec., Fox River Valley & Lake Shore Safety Council, Fond du Lac, Wis.

May 21, 1931. Erie, Pa. Northwestern Pennsylvania safety conference. S. M. Lippincott, sec., Erie Safety Council, Erie, Pa.

May 21, 22, 1931. Columbus, O. Annual meeting, National Concrete Burial Vault Assn. J. H. Stuart, sec., Bremen, O.

June 3-4, 1931, White Sulphur Springs, W. Va. Thirteenth annual convention, National Lime Assn., New Greenbriar Hotel. N. G. Hough, president and general manager, 927 15th St., N. W., Washington, D. C.

June 8-12, 1931. White Sulphur Springs, W. Va. Annual convention National Fertilizer Assn., New Greenbriar Hotel. Charles J. Brand, executive secretary and treasurer, 616 Investment Bldg., Washington, D. C.

June 10, 1931. Buffalo, N. Y. Mid-year meeting, Gypsum Assn., Statler Hotel. Henry J. Schweim, chief engineer, 211 W. Wacker Drive, Chicago, Ill.

June 22-26, 1931, Chicago, Ill. Thirty-fourth annual meeting, American Society for Testing Materials. Stevens Hotel. R. E. Hess, asst. secy., 1315 Spruce St., Philadelphia, Pa.

October 12-16, 1931. Chicago, Ill. National Safety Congress. W. H. Cameron, secretary, National Safety Council, 20 N. Wacker Drive, Chicago, Ill.

Pumpings from the Old Pit

Excerpts from the old files of PIT AND QUARRY *reveal many interesting sidelights on the activities of the pits, quarries and plants of former days. These are printed in this column each issue.*

Fourteen Years Ago

THE National Association of Sand and Gravel Producers was organized in Chicago. The benefits to be expected to attend such an organization were discussed by Frank D. Bradley, Toledo, O.; George V. Miller, Indianapolis, Ind.; H. Donnelly, Cincinnati, O.; and O. S. Stepanian, Columbus, O. The officers elected to serve during the first year were: president, H. Donnelly, Miami Stone & Gravel Co.; vice-president, Walter F. Jahncke, New Orleans, La.; secretary, E. Guy Sutton, Carmichael Sand & Gravel Co., Williamsport, Ind.; treasurer, F. W. Renwick, Chicago Gravel Co., Chicago, Ill.; directors for one year: J. L. Shiely, St. Paul, Minn.; Milton McDermott, Knoxville, Tenn.; and C. R. Nutt, Plymouth, Wis.; directors for two years: W. R. Webster, Mason City, Ia.; J. S. Westra, Grand Rapids, Mich., and B. H. Atwood, Chicago, Ill.

* * *

Ten Years Ago

CITIZENS of Danville, Ill., succeeded in having a bill introduced in the city council to restrain the working of sand-gravel pits within one hundred feet of any street or alley, upon the plea that such excavations become breeding places for vermin and are prejudicial to sanitation, as they ultimately become dumping grounds for all sorts of refuse.

* * *

The operations of the Canada Crushed Stone Corp., Dundas, Ont., had continued without interruption for a year, notwithstanding its northerly location. C. M. Doolittle, president, had installed numerous sorts of up-to-date equipment and labor-saving devices. One such improvement automatically recorded, on an electrical-clock-operated chart, the exact moment that every carload of rock was dumped to the primary crusher. Any unusual interval on the chart required an explanation from the quarry foreman. The payroll carried 120 to 137 men, all of whom worked on a bonus system with complete satisfaction. One reason for the company's success was that the provincial and county officials purchased and stocked rock during the winter in readiness for the spring road-building projects.

* * *

Five Years Ago

IN the translations of two articles by German writers, interesting developments in the technology of cement were presented. G. Agde and R. Klem discussed Ciment fondu, believed that aluminum cement was known as early as Portland cement, and stated that the German bauxite would produce as good cement as the French bauxite. Paul Hansel traced developments in Portland cement following the World War, with digests of the salient findings by numerous German scientists.

* * *

The Verplank, Cedar Cliff and Clinton Point plants of the New York Trap Rock Corp. were described in detail by F. A. Westbrook. These were regarded as typically modern and efficient. Their combined production of crushed rock was 10,000 tons. N. D. Lancaster was president; W. P. Foss, vice-president; R. W. Jones, treasurer; and R. T. Gent, general superintendent. The superintendents were: Thomas Kelleher, Verplank plant; P. J. Gilchrist, Cedar Cliff plant; and Thomas Lynch, Clinton Point plant.

J. B. Knaebel has joined the staff of the U. S. Bureau of Mines, with headquarters in Washington, D. C. He will work on the mining methods investigations being conducted by the Bureau.

Personal Mention

George Lindsay, general superintendent of the Material Service Corp., recently removed his headquarters from La Grange, Ill., to Lockport, Ill. He is personally supervising the operation of the Lockport gravel plant with the assistance of Harry Brown and Henry Garver. Fred Herkel, formerly superintendent of the Lockport plant, has been transferred to Carpenterville, Ill., and is in charge of the company's gravel plant there.

John Kain, of the Kain Granite Co., Helena, Mont., recently entertained the members of the Kain basket-ball team at a dinner in honor of their winning the city basket-ball championship. Mr. Kain presented the lads with a silver cup.

E. P. Bauer, quarry foreman at the Three Forks Portland Cement Co. plant at Trident, Mont., is on a leave of absence, which he is spending in California. He will return to his duties the latter part of May.

Everett P. Partridge, who has been engaged in boiler-scale work at the University of Michigan and served as associate editor of Industrial & Engineering Chemistry, has been appointed supervising engineer of the non-metallic minerals experiment station of the U. S. Bureau of Mines, New Brunswick, N. J. He will devote himself exclusively to his new duties after April.

William Brewster, arc-welding specialist of the General Electric Co., New Haven, Conn., recently gave a demonstration of welding before the Hartford, Conn., chapter of the American Society for Steel Treating.

F. W. Decker, formerly sales manager of the power-products department, Western division, Johns-Manville Corp., has been attached to the general industrial department, handling pipe-line protection, located at Chicago. **G. A. Barker,** formerly sales manager of the power-products department, Pacific division, has been promoted to the position of sales manager of the power-products department of the Western division, succeeding Mr. Decker. **A. W. Knight,** formerly supervisor in the power-products department of the Pacific division, has been promoted to the position of sales manager of the power-products department, Pacific division, succeeding Mr. Barker.

F. C. Thompson, vice-president and general manager of Morse Chain Co., Ithaca, N. Y., and Detroit, subsidiary of Borg-Warner Corp., announces the appointment of R. W. Appleton as purchasing agent at Ithaca. Mr. Appleton was formerly director of purchases of Pierce Arrow Motor Car Co.

H. W. Butler.

H. W. Butler of Rochester, N. Y., has been named eastern field representative and sales engineer by the Butler Bin Co. of Waukesha, Wis. Mr. Butler's previous connection as general superintendent for Whitmore, Rauber & Vicinus of Rochester, N. Y., gave him experience that eminently fits him for the duties he assumes as they embraced general contracting, material handling and central-mixing-plant operation. Mr. Butler will travel in the east contacting the various Butler Bin Co. distributors in that territory and assist them in their sales efforts on Butler equipment.

Arnold S. Durrant, for the past six years vice-president in charge of commercial relations of the International General Electric Company, Inc., retired from active service on March 1, and was made an honorary vice-president of the company following a connection of forty years with the General Electric organization.

H. E. Hilts has been named vice-president of Lone Star Cement Co. Pennsylvania, to succeed **D. S. MacBride,** according to an announcement by George E. Lewis, treasurer.

A. F. Steen, furnace engineer in charge of heat-treating equipment, International Harvester Co., tractor works, for more than eight years, has associated himself with the Chicago Steel Foundry Co., manufacturers of heat- and abrasion-resisting alloys, in charge of the service department, furnace engineering. **Walter J. Hansen,** sales engineer associated with Electro Alloys Co., Elyria, O., for the past nine years, has been employed by the Chicago Steel Foundry Co. for the sale of Pyrasteel and Evansteel, with headquarters at Syracuse, N. Y.

R. H. Wallace is installing storage and screening facilities at his sand-and-gravel plant located near Lapwai, Idaho.

Fred Byram, 839 West 45th street, Seattle, Wash., has taken out a permit for the construction of a $1,000 rock-crushing plant.

R. B. Young, of Toronto, testing engineer for the Hydro-Electric Power Commission of Ontario, Canada, has been appointed chairman of a newly-organized technical subcommittee formed by Committee C-9 on Concrete and Concrete Aggregates, of the American Society for Testing Materials. The new subcommittee will study problems relating to the production and use of ready-mixed concrete. The subcommittee has under way a specification which it is hoped will form the basis of a purchase specification covering this material.

Obituary

E. L. Conwell, head of E. L. Conwell & Co. of Philadelphia and a member of the A. S. T. M. Committee C-1 on Cement and Committee C-9 on Concrete and Concrete Aggregates, died recently.

Beverly L. Worden, president of Cutler-Hammer, Inc., makers of electrical apparatus with headquarters in Milwaukee, Wis., died recently. He had undergone an operation and his health had been bad for several months.

T. H. Jaite, 72, pioneer paper-bag manufacturer, passed away at his home in Jaite, O., recently. Mr. Jaite was widely known among cement-mill executives as president of the Jaite Co., manufacturers of Jaite paper bags, and was active in the business up to the time of his death.

Andrews Allen, 61, president of Allen & Garcia, consulting and contracting engineers, Chicago, Ill., died suddenly March 21, in a hotel at Jasper, Ala., of a heart attack. He had been supervising the erection of a coal plant and was, apparently, in sound physical condition. Mr. Allen graduated in mechanical engineering from the University of Wisconsin in 1891. He has resided for many years in Glencoe, Ill. His remains were shipped to Chicago for cremation, the ashes to be stored permanently in his family's vault at Madison, Wis. He leaves a widow and three sons. He was a member of the American Institute of Mining Engineers, the Western Society of Engineers, and various social and civic clubs.

Latest Portland-Cement Statistics

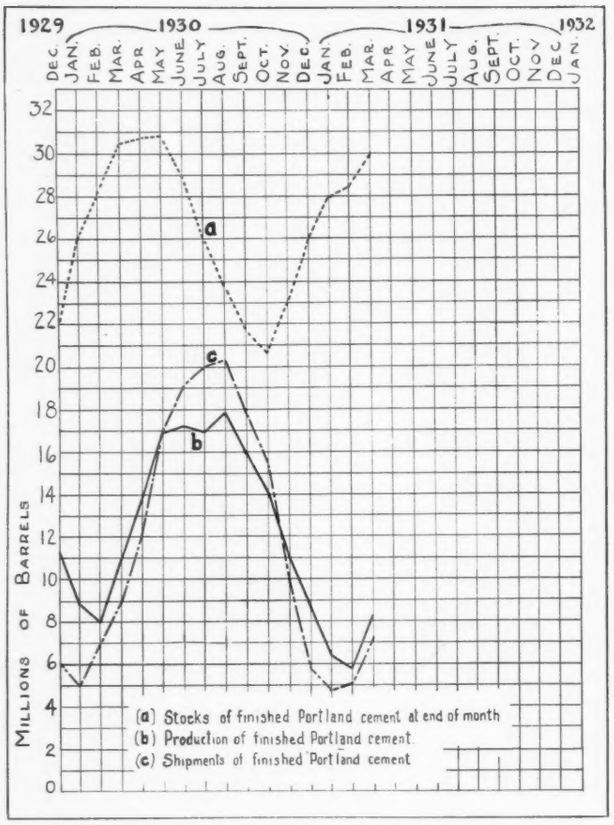


Chart showing production, shipments and stocks on hand, by months, from December, 1929, to March, 1931.

THE Portland-cement industry in March, 1931, produced 8,227,000 barrels, shipped 7,172,000 barrels from the mills, and had in stock at the end of the month 29,627,000 barrels. Production of Portland cement in March, 1931, showed a decrease of 26.7 per cent and shipments a decrease of 18.7 per cent, as compared with March, 1930. Portland cement stocks at the mills were 3.3 per cent lower than a year ago.

In the statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 165 plants both at the close of March, 1931, and of March, 1930. The estimates include increased capacity due to extensions and improvements during the period.

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES IN FEBRUARY, 1931

Exported to—	Barrels	Value
Canada	1,055	$ 5,851
Central America	1,978	5,528
Cuba	2,626	5,828
Other West Indies and Bermuda	1,239	2,482
Mexico	2,033	7,709
South America	13,494	41,285
Other Countries	3,278	20,306
Total	25,703	88,989

DISTRIBUTION OF CEMENT

Shipped to—	January		February	
	1930	1931	1930	1931
Alabama	106,309	88,798	135,425	103,610
Alaska	1,590	11	132	159
Arizona	49,286	36,015	35,218	36,834
Arkansas	43,629	54,904	80,512	43,685
California	560,052	580,888	695,831	532,384
Colorado	14,818	20,937	43,570	32,603
Connecticut	63,245	40,081	60,197	40,716
Delaware	12,810	10,916	16,100	15,566
District of Columbia	44,747	53,960	48,482	56,388
Florida	91,344	64,038	82,931	60,601
Georgia	87,956	83,687	90,938	81,500
Hawaii	27,413	24,971	25,734	28,265
Idaho	2,585	4,465	9,943	7,472
Illinois	182,347	195,146	356,200	227,023
Indiana	94,596	79,310	189,599	108,914
Iowa	34,357	30,333	111,155	73,262
Kansas	45,558	70,951	191,412	111,835
Kentucky	32,854	56,581	74,974	73,215
Louisiana	175,009	133,695	285,398	156,356
Maine	14,125	8,263	14,370	9,015
Maryland	80,253	48,532	101,896	71,391
Massachusetts	104,522	106,524	89,617	69,184
Michigan	203,440	174,367	258,450	170,815
Minnesota	59,107	46,987	111,059	62,726
Mississippi	52,518	37,644	48,264	31,532
Missouri	76,507	167,209	244,403	182,133
Montana	6,175	9,502	12,497	10,912
Nebraska	22,811	16,464	71,051	49,142
Nevada	5,452	2,455	8,306	6,231
New Hampshire	9,598	6,586	9,612	7,359
New Jersey	257,563	135,679	252,624	151,941
New Mexico	10,758	12,200	16,490	14,839
New York	681,645	653,705	663,031	622,266
North Carolina	64,998	30,352	75,768	42,771
North Dakota	2,787	2,737	10,070	5,790
Ohio	243,570	188,631	403,404	219,903
Oklahoma	99,486	115,140	234,569	125,682
Oregon	25,776	36,696	67,025	38,148
Pennsylvania	442,728	323,776	488,412	343,903
Porto Rico	1,750	620	1,750	1,020
Rhode Island	22,295	13,249	18,256	11,454
South Carolina	44,806	170,545	49,865	298,443
South Dakota	11,204	6,533	31,133	21,300
Tennessee	85,912	65,246	110,578	56,391
Texas	299,248	327,904	508,921	309,196
Utah	12,529	6,075	21,954	13,991
Vermont	21,257	2,869	14,964	2,014
Virginia	71,683	61,804	97,003	81,003
Washington	47,785	110,948	124,926	129,223
West Virginia	48,025	52,512	62,589	56,430
Wisconsin	77,039	66,531	140,053	85,088
Wyoming	2,755	4,854	6,225	5,333
Unspecified	8,760	25,533	17,732	63,233
	4,889,372	4,668,359	6,920,618	5,070,190
Foreign countries	65,628	23,641	91,382	3,810
Total shipped from cement plants	4,955,000	4,692,000	7,012,000	5,074,000

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN FEBRUARY, 1931

Imported from—	District into which imported	Barrels	Value
Belgium	New York	3,809	$ 3,648
Denmark	Porto Rico	3,979	4,202
France	New York	173	391
	Los Angeles	173	399
	Total	346	790
Germany	Los Angeles	2,975	5,538
	San Francisco	40	69
Japan	Total	3,015	5,607
	Hawaii	11,221	12,003
	Grand total	22,370	26,250

RELATION OF PRODUCTION TO CAPACITY

	March		February	January	December
	1930 (*per cent*)	1931 (*per cent*)	1931 (*per cent*)	1930 (*per cent*)	1930 (*per cent*)
The month	51.5	36.9	29.4	29.5	38.2
The 12 months ended	66.1	58.6	59.7	60.6	61.5

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1930 AND 1931 (*In thousands of barrels*)

Month	Production		Shipments		Stocks at End of Month	
	1930	1931	1930	1931	1930	1931
January	8,498	6,595	4,955	4,692	27,081	27,606
February	8,162	5,920	7,012	5,074	28,249	28,572
March	11,225	8,227	8,826	7,172	30,648	29,627
April	13,521	.....	13,340	.....	30,867	.....
May	17,249	.....	17,224	.....	30,891	.....
June	17,239	.....	18,781	.....	29,364	.....
July	17,078	.....	20,153	.....	26,289	.....
August	17,821	.....	20,299	.....	23,824	.....
September	16,124	.....	18,083	.....	21,889	.....
October	14,410	.....	15,599	.....	20,697	.....
November	11,098	.....	8,784	.....	23,056	.....
December	8,480	.....	5,688	.....	25,883	.....
Totals	160,905	.....	158,744	.....	.....	.....

PRODUCTION AND STOCKS OF CLINKER, BY DISTRICTS, IN MARCH 1930 AND 1931
(*In thousands of barrels*)

District	Production		Stocks at End of Month	
	1930	1931	1930	1931
Eastern Pa., N. J., and Md	3,120	2,489	2,223	1,892
New York and Maine	627	669	987	1,314
Ohio, Western Pa., and W. Va	1,341	623	1,643	1,645
Michigan	716	381	1,705	1,852
Wis., Ill., Ind., and Ky	1,626	980	2,011	1,741
Va., Tenn., Ala., Ga., Fla., and La	1,195	933	879	902
Eastern Mo., Ia., Minn., and S. Dak	1,255	1,137	1,018	1,006
W. Mo., Neb., Kans., Okla., and Ark	1,031	716	475	871
Texas	656	430	507	300
Colo., Mont., Utah, Wyo., and Idaho	207	203	235	287
California	877	813	1,268	1,085
Oreg. and Wash	394	182	552	427
Totals	13,045	9,556	13,503	13,322

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN MARCH 1930 AND 1931, AND STOCKS IN FEBRUARY, 1931 (*In thousands of barrels*)

District	March						Stocks at End of February
	Production		Shipments		Stocks at End of Month		
	1930	1931	1930	1931	1930	1931	1931
Eastern Pa., N. J., and Md	2,717	2,293	2,311	1,724	7,095	6,622	6,054
New York and Maine	618	437	472	381	1,702	2,013	1,957
Ohio, Western Pa., and W. Va	1,205	444	724	595	3,882	3,554	3,705
Michigan	383	73	411	286	2,734	2,600	2,814
Wis., Ill., Ind., and Ky	1,129	797	696	526	4,578	4,237	3,966
Va., Tenn., Ala., Ga., Fla., and La	1,099	923	970	1,041	1,728	1,676	1,794
Eastern Mo., Ia., Minn., and S. Dak	971	869	502	494	3,864	3,833	3,458
W. Mo., Neb., Kans., Okla., and Ark	945	638	838	520	1,941	2,196	2,077
Texas	694	489	627	456	845	773	740
Colo., Mont., Utah, Wyo., and Idaho	240	192	163	126	518	552	486
California	873	830	816	770	1,187	998	938
Oreg. and Wash	351	242	296	253	574	573	583
Totals	11,225	8,227	8,826	7,172	30,648	29,627	28,572

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1930 AND 1931

Month	Exports				Imports			
	1930		1931		1930		1931	
	Barrels	Value	Barrels	Value	Barrels	Value	Barrels	Value
January	82,387	$293,135	41,199	$115,678	201,609	$207,461	97,057	$132,937
February	64,267	217,798	25,703	88,989	114,455	119,717	22,370	26 250
March	117,563	357,896	.....	.....	43,622	59,981	.....	.....
April	57,419	200,217	.....	.....	140,871	178,226	.....	.....
May	57,423	198,170	.....	.....	94,696	111,998	.....	.....
June	82,077	223,639	.....	.....	55,356	74,370	.....	.....
July	47,082	166,577	.....	.....	12,404	20,973	.....	.....
August	49,031	167,579	.....	.....	35,323	39,029	.....	.....
September	46,594	153,384	.....	.....	51,096	59,721	.....	.....
October	62,690	190,305	.....	.....	75,284	84,364	.....	.....
November	50,495	151,555	.....	.....	109,124	125,448	.....	.....
December	38,680	134,260	.....	.....	44,157	59,641	.....	.....
Totals	755,708	2,454,515	.....	.....	977,997	1,140,929	.....	.....

PRODUCTION AND STOCKS OF CLINKER BY MONTHS, IN 1930 AND 1931 (*In thousands of barrels*)

Month	Production		Stocks End of Month		Month	Production		Stocks End of Month	
	1930	1931	1930	1931		1930	1931	1930	1931
January	10,504	8,129	9,646	10,384	July	15,069	.....	11,684	.....
February	10,008	7,473	11,572	11,962	August	15,244	.....	9,275	.....
March	13,045	9,556	13,503	13,322	September	14,577	.....	7,783	.....
April	15,025	.....	15,164	.....	October	13,895	.....	7,266	.....
May	16,607	.....	14,668	.....	November	11,639	.....	7,758	.....
June	15,895	.....	13,452	.....	December	9,484	.....	8,809	.....

Gypsum Sales Reflected in Lower 1930 Earnings

Increased competition from imported goods and a falling off in construction in Canada resulted in a decline in profits of Gypsum, Lime & Alabastine, Canada, Ltd., after expenses but before fixed charges, to $798,382 for 1930 from $1,315,315 in 1929. Net income, after all charges, including $238,870 for depreciation against $274,516 the year before, totaled $308,364, equal to 68 cents a share on 450,876 shares no-par common stock. Net income for 1929 was $764,340, or $1.69 a share on 450,876 shares common outstanding at end of that year. After payment of $594,303 dividends, there was a deficit for 1930 of $285,939. In 1929, dividend payments amounted to $450,547, and, after deducting these and incorporation expenses and premium on debentures, a surplus of $290,855 remained.

Late last year, the company declared a quarterly dividend of 20 cents on the common, placing the stock on an 80-cent annual dividend basis, against $1.50 previously, the first quarterly payment on new basis being made January 2, 1931.

Falling off in earnings last year reflected a decline of 11 per cent in volume of sales. The physical condition of properties, however, was improved and expanded. The Calgary plant was completed in 1930 and has since been in continuous operation. Early in the year the company acquired the entire capital stock of Crystalite Products, Ltd., of Hamilton, and a substantial interest in Dominion Stucco Co., Ltd., of Winnipeg.

Traffic News and Comment

Recent I. C. C. Decisions

Sulphur—The Commission has found the rate on crude bulk sulphur of $6.30 per net ton, prior to May 31, 1929, from Gulf Hill, Tex., to Jackson, Miss., unreasonable to the extent it exceeded the Baton Rouge, La., combination of $6.05, though not unduly prejudicial, and has awarded reparation. The $6.05 rate, established as a joint rate on May 31, 1929, is now in effect and was found not unreasonable. I. C. C. Docket No. 22,047, Jackson Traffic Bureau, for Jackson Fertilizer Co. v. A. T. & S. F. et al.

New Complaints Filed

Stone, Sand and Gravel—The rates on stone, sand, gravel, slag and chert between points in Tennessee and Mississippi and from Anna, Ill., to points in Tennessee and Mississippi are alleged to be in violation of Sections 1, 3 and 13 of the Act, and intrastate rates in Tennessee and Mississippi to be in violation of Section 13. New rates are asked in I. C. C. Docket No. 24,328, Anna Stone Co., Anna, Ill., v. C. & G. et al.

Rate-Committee Dockets

New England Assn.

Crushed Stone—To meet motor-truck competition, it is proposed to reduce the rate on crushed stone, c. l. min. wt.[1] from New Britain (Cook's Quarry), Conn., to Waterbury, Conn., from 85c to 70c per net ton. Docket No. 22,316.

Trunk Line Assn.

Crushed Stone—To meet motor-truck competition, it is proposed to reduce the rate on crushed stone, c. l. min. wt.[1] from Morrisville, Pa., to Mays Landing, N. J., to $1.05 and to McKee City, N. J., to $1.15 per net ton. Rates to expire Nov. 30, 1931.

Fluxing Stone—Shippers at Exton, Pa., have asked that their station be shown as a point of origin, taking the same rates as Mill Lane, Pa., on fluxing limestone and limestone in Reading Co., Tariffs I. C. C. 617, 909, and J-8,766. Docket No. 26,386.

Sand and Gravel—To meet motor-truck competition, it is proposed to establish a rate on sand and gravel, c. l. min. wt.[1] from Canawaugus, N. Y., to Dansville, N. Y., of $1 per net ton, plus a switching charge of $4.50 per car. Docket No. 26,362.

Central Freight Assn.

Agricultural Limestone — Shippers at Woodville and Gibsonburg, O., have asked for a rate of $2.02 per net ton on agricultural limestone in box-cars, c. l. min. wt. 50,000 lb., to Bens Run, W. Va. The sixth-class rate now applies. Docket No. 28,075.

Carriers propose to establish, on agricultural ground limestone (processed limestone), c. l. min. wt. 50,000 lb., to points in Ohio for intrastate movement only, rates on the same level as present rates on ground limestone in box-cars. At present, this commodity takes the agricultural-lime rates, approximately 60 per cent of the sixth-class rate as shown in Item 1,545 of C. F. A. Tariff 130-T. Complete exhibit of present and proposed rates will be furnished on request. Docket No. 28,115.

Cement—To permit the through rates on cement as published in C. F. A. Tariff 218-G, from actual producing points, based on the decision of the commission in I. C. C. Docket 15,806, to apply, it is proposed to cancel the specific-commodity rates on cement from points in Michigan, Ohio, Indiana, Pennsylvania, West Virginia, Kentucky and Wisconsin to Newport News and Norfolk, Va., and points taking same rates as published in Items 1,500 to 1,535, inclusive, of C. F. A. Tariff 218-G. It is also proposed to cancel rates on cement as named in Items 1,400 and 1,410 of C. & O. Ry. Tariff 237-H. Docket No. 27,932.

A proportional rate of 4½c on cement, c. l. min. wt. 50,000 lb., marked capacity of car to govern if less, from Speeds, Ind., to Louisville, Ky., is asked by shippers. This rate is to apply only on traffic destined to river landings on the Ohio, Kentucky, Green, Barren and Cumberland Rivers and only when moving beyond Louisville, Ky., via water carriers having tariffs lawfully published and on file with the I. C. C., and will not be subject to Jones' Combination Tariff 228. At present the rate is 4½c to river landings to which no through joint rates are applicable and 6½c to river landings to which through joint rates are applicable per P. R. R. Tariff 36-C. Docket No. 28,002.

Crushed Stone, Coated—Shippers at Marble Cliff and West Columbus, O., have requested the establishment of rates on crushed stone, coated with oil, tar or asphaltum, c. l. min. wt. marked capacity of car except, when car is loaded to full visible capacity, the actual weight will apply, to points in Michigan, Illinois and Indiana. A few representative points and proposed rates in Docket No. 28,085 are:

To	Rate
Allegan, Mich.	$2.57
Annpere, Mich.	2.11
Cassopolis, Mich.	2.34
Grand Rapids, Mich.	2.68
Lakeland, Mich.	1.99
Muskegon, Mich.	2.80
Decatur, Ill.	2.80
Paris, Ill.	2.34
Cannelton, Ind.	2.91
Effner, Ind.	2.34
Stroh, Ind.	2.11

Dolomite, Roasted—Reduced rates on dolomite (roasted or burned) c. l. min. wt.[1] to Detroit, Mich., are proposed by shippers in Docket No. 27,968 as follows:

From	Proposed *(per ton)*	Present *(per ton)*
Woodville, O.	$1.44	$1.70
Gibsonburg, O.	1.44	1.80
Bettsville, O.	1.44	1.80
Maple Grove, O.	1.44	1.80

Lime—An increase in the rate on lime from the Marion, O., group to Tawas City, Mich., from 16½c to 17c per 100 lb., is proposed by carriers. The present rate to East Tawas is 17c. Docket No. 27,985.

Lime and Plaster—Shippers propose the publication of an item in C. F. A. Exceptions to the Official Classification, 130-T, providing for mixed-carload shipments consisting of 10,000 lb. or more of plaster at the c. l. rate applicable on plaster, and 30,000 lb. or more of lime (common, hydrated, quick or slaked but not including agricultural or fluxing lime having no commercial value for chemical or building purposes) at the carload rate applicable on lime, from Woodville and Gibsonburg, O., to C. F. A. and Trunk Line Assn. territories. At present Rule 10 of the classification governs. Docket No. 27,955.

Sand and Gravel—Reduced rates on sand and gravel, c. l. min. wt.[1] to points in C. F. A. territory have been requested by shippers at Munger, Ill. A few representative rates are shown below. Docket No. 28,024.

To	Present	Proposed
Woodville, Ind.	$1.30	$0.80
Coburg, Ind.	1.35	0.85
North Judson, Ind.	1.35	0.85
Zadoc, Ind.	1.35	0.85
South Bend, Ind.	1.40	0.90
Porter, Ind.	1.30	0.80
Sweeney's, Ind.	1.40	0.90
North Liberty, Ind.	1.40	0.90
Michigan City, Ind.	1.35	0.85

Southern Freight Assn.

Cement—It is proposed to establish rates on cement from Kosmosdale, Ky., to points in Missouri (south of the Missouri River) and Kansas, based upon I. C. C. Docket 8,182 scale, this being the basis recently authorized from Birmingham and other Alabama producing points. Docket No. 54,561.

Stone, Sand and Gravel—Carriers propose to establish rates on crushed stone, sand, gravel and other commodities prescribed in I. C. C. Docket 17,000, part 11, from points in Mississippi and Louisiana east of the Mississippi River to points in Southwestern Freight Bureau Territory, based on the scale prescribed in the above case, plus 8c per ton to cover transfer at lower Mississippi River crossings. Docket No. 54,562.

Feldspar—Shippers of feldspar at Erwin, Minpro, Spruce Pine, Toecane, Bowditch, and Cane Branch, Tenn., are

asking that the rates which now apply to Kittaning, Pa., be extended to cover Parkers Landing, Pa. Docket No. 54,616.

Lime—Shippers at Sherwood, Tenn., propose a reduction in the rate on chemical lime, c. l. min. wt. 60,000 lb. to Chillicothe, O., from $5.22 per net ton to $4.16 per net ton. Docket No. 54,416.

Mica—Carriers propose to establish a rate on dry-ground mica and mica schist, c. l. min. wt. 60,000 lb. from Biltmore, N. C., to Pensacola, Fla., of 28½c per 100 lb. This rate was recently approved to Mobile, Ala. Docket No. 54,584.

Slag—It is proposed to provide that on slag, carload, from competitive points to Mobile, Ala., for export or coastwise movement, arriving at Mobile via the A. T. & N. R. R. and which is handled over the tipple of the Alabama state docks, the rate to Mobile, Ala., will include tippling charge of 25c per net ton. Docket No. 54,461.

Talc—Shippers at Chatsworth, Cartersville, Canton, Jasper, Ga., and Kinsey and Ranger, N. C, have asked for a rate on soapstone or talc, c. l. min. wt. 50,000 lb. of $6.86 per net ton to Martinsville, W. Va. Combination rates now apply. Proposed rates were suggested by the carriers. Docket No. 54,599.

Western Trunk Line

Sulphur—Reduced rates on sulphur (brimstone) c. l. min. wt. 60,000 lb. as proposed by shippers at Racine, Wis., to representative destinations in Wisconsin are shown below. Complete copy of exhibit will be furnished on request. Docket No. 1,679-A.

To	Miles	Present	Proposed
Green Bay, Wis...	135	$0.185	$0.13
Marinette, Wis. ...	184	0.185	0.145
Stevens Point, Wis.	174	0.185	0.15
Rothschild, Wis....	209	0.185	0.16
Rhinelander, Wis..	248	0.21	0.17
Eau Claire, Wis...	258	0.21	0.185

Southwestern Freight Bureau

Cement—It is proposed to establish on cement, c. l. min. wt. 50,000 lb., from Spocari and Leeds, Ala., and other points of origin named on page 9 of S. W. L. Tariff 94 to points in Texas on the T. & P. Ry. west of Big Spring, and to points on the T. & N. O. west of Del Rio, Tex., rates based on Scale 4 of Docket 15,151 where the distance is 1,200 miles or less. For distances in excess of 1,200 miles employ the extended scale presently published in Item 110 of S. W. L. Tariff 94. Scale 4 rates have been extended to points west of Big Springs and Del Rio, to and including El Paso and Ada, Okla. and the Kansas Gas Belt, and shippers request rates published from Spocari on the same basis. Docket No. 22,578.

Feldspar—Commodity rates on feldspar, c. l. min. wt. 50,000 lb., of 38½c per 100 lb. from Boulder, Canon City, Denver, Echo, Feldspar, Golden and Spikebuck, Colo., and 41c per 100 lb. from Buena Vista, Colo., to Santa Anna, Tex., have been proposed by shippers. A glass-bottle factory at Santa Anna has been completed and is ready to begin manufacturing, and will be receiving shortly shipments of feldspar from the Colorado points. Docket No. 22,628.

Limestone—Shippers are requesting the establishment on limestone (ground or crushed), c. l. min. wt.[1] from Valmeyer, Ill. to certain points in Oklahoma and Texas, specific rates based on 8½ per cent of the contemporaneous first-class rates published in S. W. L. Tariff 151. In the event that instances arise where, on account of the fourth section, the 8½-per cent basis cannot be applied via all routes to certain points, it will be proper to employ a higher basis, the 8½-per cent basis to be observed as minimum. Also the rates are to be made sufficiently high to clear Arkansas and Louisiana border points where rates are to-day on the I. C. C. Docket 9,702 basis in S. W. L. Tariff 114-D. Also, no reductions are contemplated to Missouri and Kansas points from the St. Louis group. A complete list of the destinations in Oklahoma and Texas covered by this proposal will be furnished on request. Shippers at Valmeyer state that they cannot compete with shippers in the Southwest where the 17,000 part 11 basis of rates is in effect (mainly shippers in Arkansas) and request the same basis of rates. However, it was felt that the 8½-per cent basis, as contended for by carriers in pending proceedings, was as low as the carriers would go in this instance. The shipper has agreed to give this basis a trial. In view of this, it is felt that the proposed basis should be checked out and the rates made available for shipments in the immediate future. Docket No. 22,554.

Trans-Continental Bureau

Cement—Carriers propose to amend Item 1,995 of Tariff 1-I to provide a rate of 65½c per 100 lb., on cement, c. l. min. wt. 60,000 lb., from New York piers of the Morgan Line to Rate Bases 2 and 3, via Southern Pacific steamship lines (Morgan Line) to New Orleans, La., Galveston or Houston, Tex. (Clinton docks), T. & N. O. R. R., El Paso, Tex., thence Sou. Pac. R. R. and/or connections; proposed rate to apply as a proportional rate on traffic originating at Northampton and Navarro, Pa. Docket No. 12,219.

Plaster and Plasterboard—The standing rate committee proposes to amend Item 4,491, Tariff 1-I, by publishing the following carload rates, min. wt. 60,000 lb., in lieu of the present rates to California, from groups E-F, 63 cents, and from groups G-H-J, 55 cents per 100 lb. It is also proposed to amend Item 1,210 of Tariff 4-F as follows: (a) Eliminate restrictions as to Utah gateways opposite 63c rate from points in Iowa, Minnesota and Kansas (Group E or G, first block). b) Establish rate of 71c per 100 lb. from Group E points in Oklahoma (second block). c) Establish rate of 71c per 100 lb. from points in Texas and Oklahoma in Group H (third block). d) Eliminate the restriction opposite points in Oklahoma taking Group E rates as to routing via the C. B. & Q. R. R. via Billings, Mont., also U. P. via Pocatello, Ida., only (second block). e) Eliminate the restriction under gateways and use the authorized gateways from points in Texas and Oklahoma Group H rates (third block). Docket No. 12,216.

Shippers have requested amendment of Item 1,210 of Tariff 4-F, to provide for alternative rates on plasterboard, carload min. wt. 40,000 lb., from origin points to the North Coast; proposed rates to be on proper relationship with rates at 60,000 lb. minimum. Docket No. 12,223.

Silica Sand—Shippers have requested a rate of 40 cents per 100 lb. carload min. wt. 100,000 lb., on silica sand and silica flour from Group D and west to the Pacific Coast under tariffs 1-I and 4-F. Docket No. 12,212.

[1] The proposed carload minimum weight will be 90 per cent of the marked capacity of the car except, when car is loaded to full cubical or visible capacity, actual weight will apply.

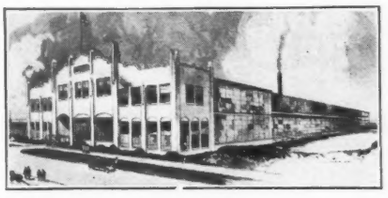
Questions and Answers

Q. We have reason to believe that a competitor is receiving information concerning our shipments from an employee of the railroad company. Is there any law that prohibits giving this information, or are the railroad records open to the public?

A. Paragraphs 11 and 12 of the Interstate Commerce Act forbid any carrier to disclose or to permit to be disclosed any information concerning the nature, kind, quantity, destination, consignee, or routing of any property tendered for interstate transportation, unless authority to do so is given by the shipper or consignee. This section also prohibits any person or corporation from soliciting or receiving any such information.

Bin Manufacturer Adds Wisconsin Plant Units

The Butler Bin Co. has recently enlarged its plant at Waukesha, Wis., by a substantial addition increasing the capacity approximately 50 per cent. Beside adding to the shop area, space has been provided for a new and modern tool-room, with additional capacity in the template department and drafting room. Other changes include the installation of a modern system of general and private offices.



View of the enlarged plant.

The Butler Bin Co. manufactures steel bins, weighing and volume-measuring hoppers, and similar equipment.

Financial News

The information contained in these financial pages is given with the understanding that any statement on the part of this magazine or any of its staff, as to the responsibility or standing of any person, firm or corporation, or as to the value of any property or securities is a mere expression of opinion, given as a matter of service to the readers of PIT AND QUARRY, *for which no responsibility in any way is to attach to this magazine or to any of its staff.*

Asbestos Corp. Outlook Dim; Blame Importations

Although interest payments have not been made on general mortgage bonds of Asbestos Corp. of Montreal since January 1, 1930, and no payments made on first-mortgage bonds since July 1, 1930, directors of the company have not as yet considered any definite plans for reorganization of the financial structure, as the outlook is considered too obscure.

The Rhodesian asbestos mines have shown a disposition to coöperate with Canadian producers with a view to price stabilization, but despite monthly meetings among the executives of Canadian companies, no agreement has been reached.

Russia, producing only 16 per cent of the total world output of asbestos, is dominating the price situation, according to Col. R. F. Massie, president of Asbestos Corp. In 1929, Russia slipped into the export market with 25,000 tons. In 1930 her exports amounted to 150,000 tons, or about 16 per cent of the total output, in dollar value. Russia now is offering crude asbestos, delivered in New York at $210 a ton, as against the 1929 price of $600 to $650. At least one Canadian mine has been attempting to meet these prices, thus further unsettling the market.

In the opinion of Col. Massie, unless Canadian asbestos mines can reach an agreement looking to price stabilization, Canada will shortly face the combined competition of Rhodesian and Russian producers, with their much lower wage scales.

For 1930 Asbestos Corp. reported net loss of $1,229,002, after all charges, including depreciation, provision for development work, and interest (both paid and accrued). During the first two and a half months of the year, shipments were up to estimates; then, with falling off in demand due to the business depression and with increased competition and price-cutting from foreign producers, the market slumped. Efforts of the company to maintain prices resulted in heavy losses. For the full year, value of shipments dropped more than 50 per cent from 1929, of which about 15 per cent was due to reduced prices. Crude-fibre prices declined 42 per cent, spinning-fibre 54 per cent, shingle-fibre nearly 40 per cent and paper stock around 35 per cent. Prices sank to 1915 levels while costs were at about 1928 levels.

Canada Paving & Supply Has $149,908 Net Income

Canada Paving & Supply Corp., Ltd., of Toronto, Can., producers and marketers of sand and gravel through its subsidiary, Windsor Sand & Gravel Co., Ltd., reports for the year ended January 31, 1931, net income, after depreciation and dominion taxes, of $149,908. In the previous year the company reported for 14 months ended February 28, showing profit, before depreciation and dominion taxes, of $511,379.

Consolidated Oka Shows Decline in Sales in 1930

Sales of Consolidated Oka Sand & Gravel Co., one of the large producers at Montreal, declined 22 per cent in 1930 and profits, before income tax provision but after other charges, fell to $69,005 from $119,568 in 1929, according to the annual report issued recently.

Calaveras Cement Earns $91,291 Net During 1930

The Calaveras Cement Co. for the year ended December 31, 1930, reported profit from operations, after full deduction for depreciation and depletion, of $295,525. Interest and miscellaneous income of $29,614 produced a gross profit for the year of $325,140. Net profit, after all expenses, including provision for federal income tax, amounted to $91,291, equivalent to $4.04 per share of preferred stock.

Commenting on the results of the year's operations, Arthur B. Shelby, vice-president and general manager of the company, in the annual report recently issued, says:

"It is gratifying to note the maintenance of the splendid liquid position of the company, the ratio of quick assets to current liabilities having risen from 6.77 to 1 in 1929 to 11.92 to 1 in 1930, while cash items of $692,834 alone exceed surplus. The net profits shown were earned after deducting all expenses, including ample provision for depreciation of over $100,000. All surplus funds are carried on an interest-paying basis. Marked improvements have also been made in operating conditions.

"Consumption of cement during 1930 throughout the territory we serve was considerably lower than for several years. Building construction declined steadily during the entire year and few major projects were undertaken. While the demand for cement continues light, building permits are showing some increase and many large projects should soon be under way. This activity should be reflected in shipments during the remainder of this year."

CURRENT DIVIDENDS

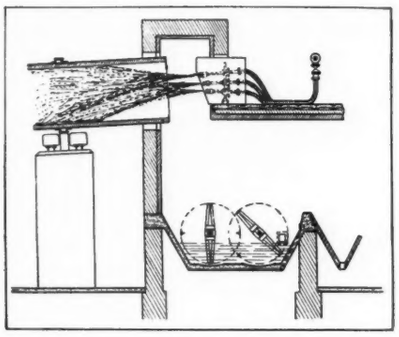
Company	Class of Stock	Dividend Rate	Holders of Record	Payable	Company	Class of Stock	Dividend Rate	Holders of Record	Payable
Alpha Portland Cement	Common	$0.25 qr.	Apr. 1	Apr. 25	Kelley Island Lime & Transport	Common	$0.62½ qr.	Mar. 20	Apr. 1
American Aggregates Corp.	Preferred	$1.75 qr.	Mar. 20	Apr. 1	Lawrence Portland Cement	Common	$1.00 qr.	Mar. 16	Mar. 31
Arundel Corp.	Common	$0.75 qr.	Mar. 23	Apr. 1	Lehigh Portland Cement	Preferred	$1.75 qr.	Mar. 14	Apr. 1
Boston Sand & Gravel	Preferred	$0.87½ qr.	Mar. 21	Apr. 1	Lehigh Portland Cement	Common	$0.25 qr.	Apr. 14	May 1
Boston Sand & Gravel	Common	$0.30 qr.	Mar. 21	Apr. 1	Medusa Portland Cement	Preferred	$1.50 qr.	Mar. 25	Apr. 1
Calaveras Cement Co.	Preferred	$1.75 qr.	Mar. 31	Apr. 15	Medusa Portland Cement	Common	$0.75 qr.	Mar. 25	Apr. 1
Canada Cement Co.	Preferred	$1.62½ qr.	Feb. 28	Mar. 31	National Gypsum	Preferred	$1.00 qr.	Mar. 20	Apr. 1
Consolidated Oka Sand & Gravel	Preferred	$1.75 qr.	Mar. 24	Apr. 1	Newayo Portland Cement	Preferred	$1.75 qr.	Mar. 25	Apr. 1
Consumers Co	Preferred	$1.50 qr.	Mar. 25	Apr. 1	New York Trap Rock	Preferred	$1.75 qr.	Mar. 20	Apr. 1
Coronet Phosphate	Common	$1.50 qr.	Mar. 25	Apr. 1	Owens-Illinois Glass	Preferred	$1.50 qr.	Mar. 16	Apr. 1
Dolese & Shepard	Common	$1.00 qr.	Mar. 20	Apr. 1	Pacific Portland Cement	Preferred	$1.62½ qr.	Mar. 31	Apr. 4
Dufferin Paving & Crushed Stone	Preferred	$1.75 qr.	Mar. 20	Apr. 1	Pennsylvania Salt	Common	$0.75 qr.	Mar. 31	Apr. 15
Fitzsimons & Connell	Preferred	$1.75 qr.	Mar. 21	Apr. 1	Pittsburgh Plate Glass	Common	$0.50 qr.	Mar. 10	Apr. 1
Gypsum, Lime & Alabastine, Ltd.	Common	$0.20 qr.	Mar. 28	Apr. 1	Santa Cruz Portland Cement	Common	$1.00 qr.	Mar. 21	Apr. 1
Ideal Cement Co.	Common	$0.75 qr.	Mar. 14	Mar. 31	Superior Portland Cement	Class B	$0.25 qr.	Mar. 14	Mar. 20
International Cement	Common	$1.00 qr.	Mar. 11	Mar. 31	U. S. Gypsum Co	Preferred	$1.75 qr.	Mar. 14	Mar. 31
International Salt	Common	$0.75 qr.	Mar. 16	Apr. 1	U. S. Gypsum Co	Common	$0.40 qr.	Mar. 14	Mar. 31
Johns-Manville	Preferred	$1.75 qr.	Mar. 11	Apr. 1	Wallace Sandstone	Preferred	$1.50 S.A.	Mar. 30	Apr. 15
Johns-Manville	Common	$0.75 qr.	Mar. 25	Apr. 15	Warner Company	Common	$0.50 qr.	Mar. 31	Apr. 15
					Warner Company	1st Pfd.	$1.75 qr.	Mar. 14	Apr. 1
					Warner Company	2nd Pfd.	$1.75 qr.	Mar. 14	Apr. 1

Review of Foreign Practice

German Innovations in the Burning of Cement

Several somewhat similar contributions to the improvement of the burning of cement have been made in Germany recently, quite independent of each other. The author describes first some proposals made by himself several years ago, influenced by the fact that the coal consumption is necessarily too high in a long kiln in which only part of the length is actually a sintering zone and, even there, only a part of the kiln cross section is effectively utilized because only the particles at the surface of the heap of material are in contact with the gases. He believes that the future of cement burning will call for the introduction of the raw material in a finely-subdivided form, as with compressed air; possibly, too, a short sintering zone, from which the gases might be removed at a temperature high enough to be used in a separate process for calcining the limestone, and, in the wet process, driving off the water.

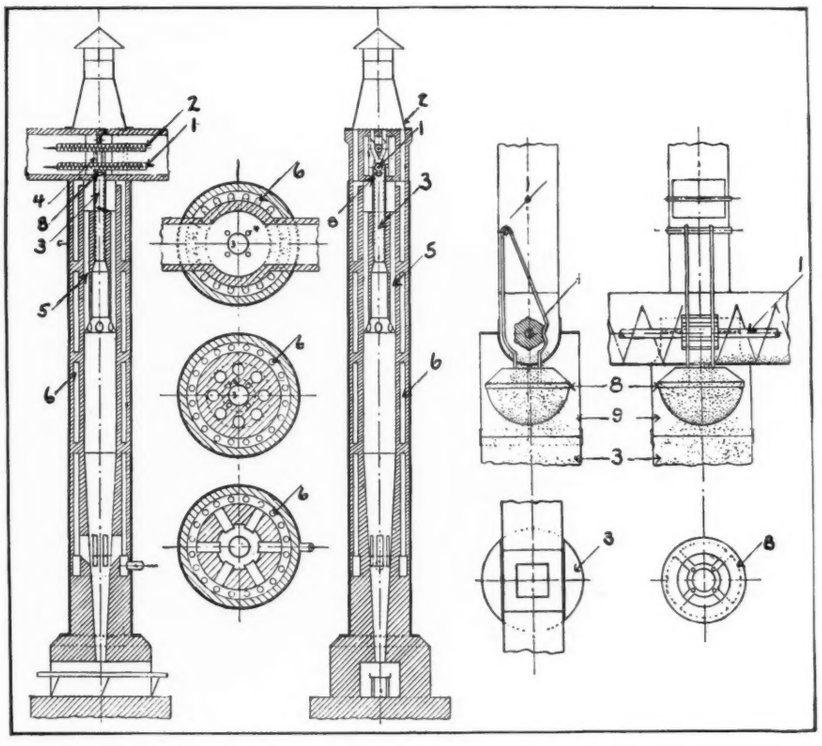
In the Schroeder vertical kiln patented in 1930 (German patent No. 459,001), the dry raw mix falls loose through the interior of a vertical shaft fired with free-falling pulverized coal. The raw mix, the fuel and the air enter the kiln separately in such a way that in horizontal section the raw mix is surrounded by the fuel and this



Slurry-spraying device for kiln feed.

by the air; in vertical section, the openings for the admission of the raw mix come first, then the fuel and then the air. In the illustration the essential parts are indicated thus: 1, screw conveyor feeding raw material; 2, screw conveyor feeding coal; 3, tube admitting the raw mix; 4, tubes admitting coal; 5, air ducts to the sintering zone; 6, ducts leading air to the collecting zone; 7, tube for removal of carbon dioxide; 8, spreader; 9, connecting tube.

Another invention, developed and patented independently, is German patent No. 478,632 of the G. Polysius Akt.-Ges., shown in the second illustration. In this device the slurry is sprayed into the rotary kiln in the form of a fine mist by means of pumps and jets. According to the manufacturer, this process reduces the consumption of coal by 15 per cent and increases capacity by 20 per cent. The equipment consists of a slurry silo of usual form and size, two pumps, the distributing pipe and control, and the spraying chamber, in which the jets are arranged. The slurry is converted into a fine mist which meets the hot gases in counter-current. In such a kiln the drying zone can be much shorter than otherwise.—Dr.-Ing. Heinrich Luftschitz in *Tonindustrie-Zeitung*, 55:184-6, Feb. 12, 1931.



Cross-sections and detail sketches of the patent vertical kiln.

French Gravel-Washing, Sizing, Crushing Plant

The Carriere de Brides is about two kilometers from Limoux, Aude, France, and consists of a gravel deposit of about 10 hectares in area. An overburden of about 20 cm. covers a gravel bed some 6 to 7 meters deep, consisting of 25 per cent of sand from 0 to 5 mm., 35 per cent small gravel from 5 to 20 mm., 35 per cent of gravel over 20 mm., some up to 150 mm., and 5 per cent of earth to be removed.

The material in the pit is excavated by hand labor. In the plant, the material is discharged from cars to a counter-current rotary washer 1 meter in diameter and 2¾ meters long, which handles 6 to 8 cubic meters hourly. From this it is chuted to a cylindrical sizing screen 3 meters long and 810 mm. in diameter, with perforations of 6, 15 and 25 mm. The oversize is chuted to a jaw crusher with an opening of 200 by 400 mm., which has a production of 5 to 7 cubic meters per hour. The crushed products are sized in a screen identical with that for the round material. — *Ciment* 36:19-22, Jan. 1931.

Determining the Surface Area of Pulverized Sand

Laborious experiments undertaken to determine the surface area of the grains of a pulverized sand have led to a method which is essentially as follows: The sand is subjected, under certain conditions, to the action of hydrofluoric acid of known concentration, and the loss of weight resulting after a given time is determined. Then in the same way a cube of quartz or a piece of cubical quartz of mensurable surface is treated, and the rapidity of solution is determined. The reaction being entirely limited to surface action, its evalution constitutes a measure of the fineness of the powder. The loss of weight is proportional not only to the surface area but also to the concentration of the hydrofluoric acid.—*Revue des Materiaux de Construction* No. 254, p. 446, Nov. 1930.

Recent Patents

AMERICAN

Burning

Method for continuous calcination of gypsum. Alva W. Tyler, San Francisco, Cal. No. 1,798,857.

Cement

Dry process for the manufacture of cement. Mikael Vogel-Jorgensen, Frederiksberg, Denmark, assignor to F. L. Smidth & Co., New York, N. Y. No. 1,798,423.

Concrete

Truck mixer, John F. Robb, Cleveland, O., assignor to Koehring Co., Milwaukee, Wis. No. 1,797,242.

Method of placing porous concretes. Karl P. Billner, New York, N. Y., assignor to Aerocrete Corp., same place. No. 1,798,924.

Crushing

Pneumatic separator for pulverizing mills. Wilson L. & Herrold L. McLaughlin, Des Moines, Ia. No. 1,797,434.

Rotary crusher. John L. Schultz, Philadelphia, Pa., assignor to American Engineering Co., same place. No. 1,198,000.

Excavating

Slack take-up and dipper-tripping mechanism for excavating apparatus. Harold E. Brey, Milwaukee, Wis., assignor to Koehring Co., same place. No. 1,797,224.

Dipper-door-tripping mechanism. Leslie A. Russell, Milwaukee, Wis., assignor to Koehring Co., same place. No. 1,797,300.

Bucket, bucket-elevator and dredge. Frank H. Cothay, London, England, assignor of one-half to Ropp Tin Limited, same place. No. 1,797,330.

Shoveling machine. William Whaley, Knoxville, Tenn. No. 1,797,459.

Excavator-scoop. Robert R. Downie, Beaver Falls, Pa., assignor to Keystone Driller Co. No. 1,797,642.

Dipper front. Alfred H. Exton, Chicago, Ill., assignor to American Manganese Steel Co., Chicago Heights, Ill. No. 1,798,873.

Material Handling

Dumping truck. Arthur S. Hughes and Howard F. Gorsuch, Mansfield, O., assignors to Hughes-Keenan Co., same place. No. 1,797,343.

Dumping truck. Arthur S. Hughes and Howard F. Gorsuch, Mansfield, O., assignors to Hughes-Keenan Co., same place. No. 1,797,344.

Bucket and hopper construction for material-elevating towers. Albert T. Scannell, Chicago, Ill. No. 1,798,501.

Plow for scraper-buckets. Robert H. Beaumont, Radnor, Pa., assignor to R. H. Beaumont Co., Philadelphia, Pa. No. 1,799,139.

Shaker screen. Edward L. Ridgdon, Barlow, and Jacob S. Risley, Milwaukie, Ore., assignors to Clyde Equipment Co., Portland, Ore. No. 1,798,433.

Separator. George D. Francisco, Columbus, O., assignor to Jeffrey Mfg. Co., same place. No. 1,798,978.

FOREIGN

Blasting

Manufacture of safety blasting fuses. Johannes Fritzsche, Wiener, Neustadt, Austria. Canadian 309,799.

Cement and Concrete

Process for production of cement which contains gypsum admixed. Carl Pontoppidan, Holte, Denmark, and Svend Buntzen, Copenhagen. German 521,712.

Rendering the cement interior surfaces of refrigerating chambers or cold stores non-porous. W. H. Partridge and W. H. Partridge. British 340,770.

Crushing and Grinding

Hammer Mill. Humboldt-Deutzmotoren Akt.-Ges., Koeln-Kalk, Germany. German 521,239.

Grinding mill. Alpine Akt.-Ges. Eisengiesserei und Maschinenfabrik and Otto Gaiser, Augsburg, Germany. German 521,349.

Crushing-roll device. Francis W. Maclennan, Miami, Ariz. Canadian 309,624.

Feed mechanisms for mills. O. Moog. British 340,851.

Cooling device for a grinding machine. E. Aust. British 341,304.

Drilling

Drill. Charles Henry Brown, Breckenridge, Tex. German 521,117.

Wedge for holding drill rods. Emsco Derrick & Equipment Co., Los Angeles, Cal. German 521,024.

Holding device for hammer drills and the like. Karl Loth, jun., Annen-in-Westfalen, Germany. German 521,982.

Drilling device. Eduard Meyer, Remmscheid, Germany. German 521,858.

Well-drilling outfit. Walter Anson Loomis, Whittier, Cal. Canadian 309,623.

Rock-drilling machine. Aktiebolaget Atlas Diesel. British 340,921.

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Drying

Rotary drier. Maschinenfabrik Imperial G. m. b. H., Meissen, Germany. German 521,100.

Drier. Hermann Haas, Lennep, Germany. German 521,777.

Drier. Francis Maxime Crossman, Paris. German 521,778.

Driers and the like. Coe Manufacturing Co. British 340,510.

Excavating

Drag-line bucket. The American Manganese Steel Co., assignee of Arthur R. Sittig, Chicago, Ill. Canadian 309,669.

Dredgers, drags and like apparatus. J. P. Grundy. British 340,712.

Kilns

Tunnel kilns. Woodall-Duckham (1920), Ltd., and A. M. Duckham. British 340,271.

Material-Handling

Device for emptying bins. Bamag-Meguin Akt.-Ges., Berlin. German 521,536.

Bin with special discharging device and car. J. Pohlig Akt.-Ges., Koeln-Zollstock, Germany. German 521,776.

Combined tractor and scoop and hoisting device. Robert B. Coffman, New Alexandria, Pa. Canadian 309,588.

Conveyor chain. Arnold Redler, Sharpness Docks, England. Canadian 309,832.

Conveyor. Edgar B. Tolman, Jr., Chicago, Ill. Canadian 309,847.

Conveyor or transporting machinery or apparatus. F. W. Semark (Brewers' Equipment Co.), J. H. Allen and W. E. Rice. British 340,737.

Apparatus for dumping and discharging cars. B. E. Ellson. British 340,831.

Pneumatic-conveyor systems. Telephon-Apparat-Fabrik. E. Zwietusch & Co., Ges. British 341,209.

Apparatus for dumping and discharging railway cars. B. E. Ellson. British 341,165.

Apparatus for handling and conveying loose solids by liquid flushing. Ash Co. (London), Ltd. (J. Rome). British 341,108.

Mixing

Mixing-time regulator for mixers of the dipping-drum type or the like. Karl Peschke Maschinenfabrik, Zweibruecken, Germany. German 521,182.

Method of and means for carrying out mixing operations on liquid, pulverulent, granular or pulpy masses. G. H. Schieferstein. British 314,097.

Rotary mixing machine. C. Forville. British 340,462.

Automatic concrete-mixing machine. J. S. Withers (Koehring Co.). British 340,545.

Sacking and Packing

Device for filling barrels with pulverulent materials. Braunschweigische Maschinenbau-Anstalt Akt.-Ges., Braunschweig, Germany, German 521,333.

Device for loading paper cement sacks. J. Pohlig Akt.-Ges., Koeln-Zollstock, Germany. German 521,334.

Container charging device. Werner

Scholz, Oberteschen, and Arno Frohberg, Cunnersdorf, Germany. Canadian 309,767.

Paper-bag machine. Alfred Clement Coty and Thomas Earl Coty, Watertown, N. Y. Canadian 309,768.

Apparatus for cleaning sacks. J. de Groeve and C. Van Dyck. British 340,446.

Paper bags. W. W. Triggs (Cornell Multi-Wall Valve Bag Co.). British 341,014.

Screening and Separating

Fan device for sifting. Hermann Hildebrandt, Hanover, Germany. German 521,082.

Control for filter. Steitz & Co., G. m. b. H., Essen, Germany. German 521,165.

Centrifugal dust separator. Johann Weber. Nuernberg, Germany. German 521,682.

Machine for disintegrating and sifting powdered masses. S. Schwalb (nee Fluss). British 340,812.

Appliances or apparatus for separating dust, grit and the like, and for removing sulphurous and other gases from flue or furnace gases. O. B. Jacobsen. British 341,058.

Construction of slot sieves. R. Herrmann. British 341,150.

Unclassified

Carrying device for excavating tools. Max Goebel, Recklinghausen, Germany. German 521,981.

Waste-heat boiler. Babcock-Wilcox & Goldie-McCulloch, Ltd., Galt, Ont., assignee of Herman Brackett Smith, Plainfield, N. J. Canadian 309,674.

Road-building material of graded mineral aggregate and a bituminous binding material. The Canadian Amiesite, Ltd., Montreal, Que., assignee of the Amiesite Asphalt Co. of America, Camden, N. J. Canadian 309,684.

Refractory plastic composition. The Fuller Lehigh Co., assignee of Ralph Martin Hardgrove, Bethlehem, Pa. Canadian 309,714.

Production of refractory materials. Ture Robert Haglund, Stockholm, Sweden. Canadian 309,803.

Mine shafts and haulage plant therefor. Skip Cie, Akt.-Ges. British 319,367.

Manufacture of refractory materials. Metallges. Akt.-Ges. British 340,487.

Machines for distributing stone grit or chips, or like material on roads. A. B. Macintosh. British 340,662.

New Corporations

KINDERHOOK SAND & GRAVEL CO., Albany, N. Y. $20,000.

BRAEN SAND & GRAVEL CO., Wyckoff, N. J. $200,000. Abram Braen, pres.; A. H. Alfast, v.-pres.; John Braen, sec.-tr.

MICHIGAN MATERIAL & CONCRETE CO., 220 Main St., Centerville, Mich. $40,000. Perry T. Sharp, 203 W. Ash St., Albion; V. E. Decker, H. W. Birdsall, Adrian. To operate pits for sand, gravel, etc.

TIPTON-HAMILTON GRAVEL CORP., Tipton, Ind. $10,000. W. W. Mount, C. M. Martz, H. C. Haskett, N. R. Lebo, I. H. Woodruff, Walter Carter, C. W. Mount, all of Tipton. Will develop Overdorf pit.

FRANKLIN LIME PRODUCTS CORP., Newton, N. J. $75,000. L. Vanblarcom, Newton, N. J.

R. BUSH ROCK & SAND CO., LTD., Los Angeles, Cal. 500 sh. n.p.v. W. F. and M. Glasser of Pacific Palisades, Cal. V. Gassaway and R. Bush, El Monte, Cal.

TWIN CITY BARGE & GRAVEL CO., 817 Hennepin Ave., Minneapolis, Minn. $100,000. J. A. Campbell, pres.-tr., 45 East Minnehaha Blvd., C. T. Welsh, v.-pres., and L. M. Derby.

LIMEROCK ASPHALT CO., Louisville, Ky. $25,000. H. C. Showalter, H. J. Russell and Joseph M. Hayes.

To Supply Compressors, Drills for Hoover Dam

Six Companies, Inc., contractors for the Hoover dam, has placed orders with Ingersoll-Rand Co. for all air-compressor and rock-drilling equipment that will be required for this record-breaking five-year project.

The stationary air plant will consist of a battery of large Class PRE type direct-connected, electric-driven compressors having a combined output of 25,000 cu. ft. per min.

These compressors will supply air for driving the four diversion tunnels that will carry the waters of the Colorado River through the canyon walls around the damsite while the dam proper is being built. Work will start immediately upon these tunnels, and it is expected that they will be finished within 18 months.

Huge Lot of Excavators Acquired by New Yorker

The Industrial-Brownhoist Corp., manufacturers of locomotive cranes and shovels, is consolidating its two plants and moving equipment from Cleveland, O. to Bay City, Mich. Aware that the company would be needing space at Bay City, and seizing an opportunity apparent only on such an occasion, Philip T. King, "The Crane Man," 50 Church St., New York, N. Y. has purchased all the stocked crawler cranes and shovels, with the understanding that no additional machines of this type would be built by the Industrial-Brownhoist Corp. for at least three months, when it is anticipated it will be settled in the new plant. These are all the latest model machines, brand new and guaranteed.

BUILDING MATERIAL PRICES, MARCH 1, 1931

Data collected by the Bureau of the Census and prepared by the Division of Building and Housing, U. S. Bureau of Standards.

City	Portland Cement (*bbl.*)	Gypsum Plaster (*ton*)	Gypsum Plaster Board (*1,000 sq. ft.*)	Lime (*ton*)	Building Sand (*cu. yd.*)	Crushed Stone (*ton*)	Roofing Slate (*100 sq. ft.*)
Akron, O.	$2.67	.....	$36.00	$18.00	$1.85	$1.85	.....
Albany, N. Y.	2.97	$15.30	24.75	18.00	1.85	1.85	.....
Atlanta, Ga.	2.38	16.90	.....	17.50	2.31	2.30	.....
Baltimore, Md.	2.40	14.50	25.00	13.50	2.75	2.75	$10.00
Buffalo, N. Y.	2.95	16.00	21.00	18.00	2.50	2.05	12.00
Canton, O.	2.95	.....	.....	16.00	2.50	3.00	.....
Chicago, Ill.	2.40	16.00	21.00	17.00	2.00	2.00	.....
Cincinnati, O.	2.62	.....	24.75	14.40	2.63	2.55	.....
Cleveland, O.	2.40	14.50	.....	12.00	1.95	2.70	16.00
Columbia, S. C.	2.35	14.40	35.00	12.00	1.50	2.75	14.00
Columbus, O.	2.35	14.40	35.00	12.00	1.50	2.75	14.00
Denver, Colo.	2.20	18.00	35.00	22.00	1.25	1.45	.....
Des Moines, Iowa	3.08	.....	.....	20.00	1.10	.....	.....
Erie, Pa.	2.40	16.00	22.50	19.00	2.00	.....	.....
Fairmont, W. Va.	2.80	18.00	35.00	16.00	3.15	3.50	13.00
Grand Forks, N. D.	3.00	20.00	.....	25.00	2.60	.....	.....
Haverhill, Mass.	2.80	18.50	25.00	20.00	.....	.....	.....
Kansas City, Mo.	2.30	15.00	25.00	24.00	1.70	2.25	17.00
Lansing, Mich.	2.90	16.50	.....	22.00	2.25	.....	.....
Los Angeles, Cal.	2.30	15.20	.....	28.50	1.85	1.90	.....
Louisville, Ky.	2.32	17.00	.....	15.50	2.20	2.43	15.00
Milwaukee, Wis.	2.08	15.20	22.00	14.00	1.50	1.50	.....
New Bedford, Mass.	2.80	16.50	24.00	16.50	1.75	3.00	.....
New Haven, Conn.	2.90	.....	.....	20.00	1.25	2.25	.....
New London, Conn.	2.80	18.00	25.00	.....	1.50	2.40	.....
Paterson, N. J.	2.40	17.50	25.00	18.00	1.50	2.10	14.00
Philadelphia, Pa.	2.30	17.50	.....	14.50	1.75	2.60	9.75
Poughkeepsie, N. Y.	2.18	.....	.....	.....	2.25	2.00	.....
Richmond, Va.	3.10	20.00	31.00	17.50	1.95	2.45	13.00
Rochester, N. Y.	3.25	17.00	22.00	20.00	1.75	2.40	12.00
Rockford, Ill.	2.80	16.00	25.00	20.00	1.60	1.15	.....
St. Louis, Mo.	2.15	18.00	.....	18.00	1.35	1.00	13.00
St. Paul, Minn.	2.45	18.00	.....	18.00	2.23	1.75	13.00
Saginaw, Mich.	2.60	17.00	25.00	18.00	2.50	3.25	14.40
San Antonio, Tex.	2.60	19.15	.....	20.00	2.25	2.35	.....
San Francisco, Cal.	2.42	19.90	.....	22.50	1.40	1.60	16.00
Scranton, Pa.	2.80	19.00	.....	20.00	3.25	.....	.....
Seattle, Wash.	1.75	20.00	.....	22.00	1.40	1.90	.....
Shreveport, La.	3.20	22.00	39.00	.....	2.00	3.80	15.00
Sioux Falls, Ia.	3.00	15.00	.....	24.00	1.25	2.25	.....
Syracuse, N. Y.	2.55	15.00	25.00	13.00	2.00	1.70	9.85
Tampa, Fla.	3.00	.....	.....	24.00	2.00	4.50	.....
Terre Haute, Ind.	2.85	18.00	28.00	18.00	1.65	3.25	13.50
Toledo, O.	2.22	14.50	20.00	12.00	1.75	2.50	.....
Trenton, N. J.	2.40	17.50	26.00	18.00	1.50	2.10	14.00
Tucson, Ariz.	3.37	17.70	.....	30.00	1.25	2.00	.....
Washington, D. C.	2.40	16.00	25.00	13.00	.....	.....	.....
Waterbury, Conn.	3.00	20.00	30.00	20.00	1.35	2.45	15.00
Youngstown, O.	2.95	.....	.....	20.00	3.75	2.50	.....

UNIVERSITY OF MICHIGAN LIBRARIES

Manufacturers' Publications

Each publication listed below contains information of interest to nonmetallic mineral producers. Readers may obtain, without charge—except where a price may be stated—and without obligation, copies of any of these publications by writing directly to the manufacturers who publish them. Please mention PIT AND QUARRY *when writing.*

Blasting

"Multiple-Shot Blasting Machines." 3 p., 19 ill. (*The Dupont Magazine* for March, 1931. E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.) Traces and illustrates the history of electric-blasting machines from their invention in 1876 to the present day.

Concrete-Products Machinery

Besser Automatic Strippers. 8 p., 12 ill. (Besser Manufacturing Co., Alpena, Mich.) Describes and illustrates an automatic stripper machine for concrete-products plants.

Conveying Systems

Fuller-Kinyon Transport System for Pulverized Coal. 8 p., 8 ill. (Catalogue No. 903. Fuller-Lehigh Co., New York, N. Y.) Describes the construction and application of a pneumatic conveying system for the transportation and distribution of pulverized coal. Besides including a general description and diagrammatic sketch of the system, the catalogue contains illustrations of the equipment and installation views.

Drills

Industrial Diamonds and Diamond Pointed Tools. 36 p. Illustrated. (The Diamond Drill Carbon Co., New York, N. Y.) Describes and illustrates the mining of bortz and carbon (black diamonds) and their application to core drills and other cutting tools.

Electrical Equipment

Safe Converti-Fuse. 12 p. Illustrated. (Circular No. 87. The Trumbull Electric Mfg. Co., Plainville, Conn.) Describes and illustrates a system for safe and economical changing in the size of branch-circuit fuses, consisting of a unit panel board with a dead front, and bakelite "caps" containing the protective elements.

Excavators

Speeder Model 90. 20 p., 23 ill. *Speeder Whirlwind.* 16 p., 24 ill. *Speeder Model B-3.* 24 p., 61 ill. (Speeder Machinery Corp., Cedar Rapids, Ia.) Three new booklets describing ⅜-, ½- and 1¼-cu.yd.-capacity convertible gasoline shovels. Detail views, operating data and specifications are included.

Pulverizers

Raymond Pulverizing Equipment. 8 p., 10 ill. (Raymond Bros. Impact Pulverizer Co., Chicago, Ill.) An informative bulletin of equipment built and installed by this concern in 1930, in which modern methods of handling powdered materials by air are described. Performance records of installed equipment are given.

Pumps, Centrifugal

Wilfley Centrifugal Sand Pump. 44 p. Illustrated. (Catalogue No. 8. A. R. Wilfley & Sons, Inc., Denver, Colo.) Describes and illustrates a centrifugal sand pump of distinctive design and wide use, employed largely for handling slurry in wet-process cement plants. A long list of important users is included.

Scrapers

Cable Power Scraper for the Storage of Coal and Other Bulk Materials. 8 p., 15 ill. (Atlas Conveyor Co., Philadelphia, Pa.) Describes and illustrates a cable power scraper. Installation views and details are shown. A chart for the selection of the proper size equipment with the required horsepower is included.

Speed Reducers

A Survey of Jones Speed Reducer Application in the Rock Product Industries. 20 p. Illustrated. (W. A. Jones Foundry & Machine Co., Chicago, Ill.) A complete survey of the application of spur, worm, herringbone and herringbone-maag gear speed reducers in cement, crushed-stone, lime, gypsum and sand-and-gravel plants. Typical plant layouts and their requirements are shown.

Handbook of Variable Speed Control. 72 p. Illustrated. (Reeves Pulley Co., Columbus, Ind.) A wealth of information on speed control in the pit-and-quarry and other industries. Includes sections on operation and care, lubrication and V-belts in the "Service Manual" portion of the handbook.

Storage Bins

The Strength of a Thousand Keystones. 8 p., 12 ill. (The Neff & Fry Co., Camden, O.) Describes and illustrates gravity storage bins built of concrete staves. Illustrations show the bins in use in a number of plant layouts.

Track Equipment

Rails—One Ton or 1,000. 124 p. Illustrated. (L. B. Foster Co., Inc., Pittsburgh, Pa.) A comprehensive loose-leaf catalogue describing and illustrating industrial rails and track equipment.

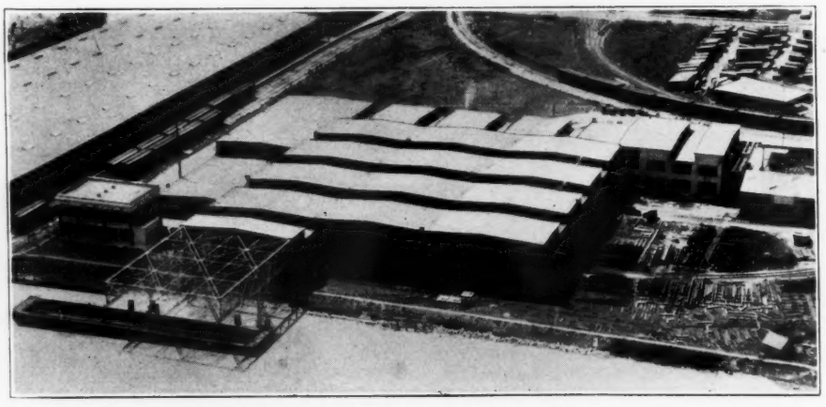
Miscellaneous

Burch Labor Saving Products. 20 p. Illustrated. (The Burch Corp., Crestline, O.) Describes and illustrates portable conveyors, car unloaders, stone and asphalt spreaders and other labor saving equipment for plant operators and road builders.

Jones & Laughlin Steel Corp. Buys Lukens Plant

The plant of the Lukens Steel Co. at New Orleans has been purchased by the Jones & Laughlin Steel Corp., according to announcement by officials of the latter company. The acquisition of this plant will give Jones & Laughlin a large, modern steel-fabricating, warehousing and distributing base at the mouth of the Mississippi River which can be served directly by river transportation from Pittsburgh, as well as by rail. Possession of the Lukens plant will be taken over by Jones & Laughlin at once.

The Lukens warehouse and fabricating shop are on a site of approximately 17 acres on the turning basin of the Industrial Canal about one mile from the Mississippi River and about six miles from the center of the city. The buildings consist of a four-bay steel structure warehouse, fabricating shop and a two-story brick office building. The plant has complete rail and water facilities, enabling the interchange of steel products between river barges and the plant, the railroads, or ocean-going vessels. According to Jones & Laughlin officials, the plant will be utilized for warehousing merchant bars, structural material, plates, concrete bars, cold finished steel bars, special shapes, junior beams, steel pipe, wire products, and other J & L products, which will be distributed out of the plant locally in New Orleans and by rail and water transport to customers in the South and Southwest, or on the Pacific Coast and in foreign countries.



New steel warehouse and rail-water terminal at New Orleans.

Insurance Problems Discussed

Self-Insurance

JUST taking my own chances—is not self-insurance.

During these times when profits come only from hard work and careful management, we sometimes hear self-insurance misinterpreted. The man who merely goes without a certain line of protection saying "I'll have to carry that risk myself" is not a self-insurer.

The lack of insurance in some lines is a natural result of hard times. Business men are scanning every item of overhead. In some cases firms are so weak financially that they have to give up coverages which they admit are important, and occasionally a producer will reduce his insurance through a short-sighted misunderstanding of the risks involved.

In passing we must comment on the fallacious judgment of many who cut off insurance to save premium. Usually such property owners wield the axe first on the casualty risks—public liability, automobile liability and fidelity bonds on employees. No one would think of dropping his fire insurance. Yet the biggest loss you could suffer from fire is the destruction of your own property, while a lawsuit or the defalcation of a bookkeeper might be big enough to wreck your business completely. If you feel that you must carry some risks yourself, be sure that you hang on to the coverages that may save you from financial ruin. The common tendency to rank fire insurance ahead of liability insurance comes only from lack of understanding of underwriting principles.

True self-insurance has nothing to do with just being uninsured. The self-insurer is not a gambler. He takes no chances, for he builds on the same theory as the insurance companies themselves. For self-insurance is not used to cover a single risk. The most obvious cases for self-insurance are the big retail chains. If you owned all the chain grocery stores in the country you probably would not carry fire insurance on them because you would be spreading your risk over as many grocery stores as any insurance company might cover and no single fire would hit you very hard anyway. Or suppose you were the head of a concern that owned a very large number of Ford automobiles for use by your salesmen. You would, of course, still have to carry public-liability insurance because of the expert claim service and because a single lawsuit might run as high as $50,000 but, on the risks of fire and theft, you might find that you could budget your own losses.

Business men are interested in self-insurance only where it saves them money. Costs being equal, one would always enjoy the mental peace of having someone else hold the bag. There probably is not much to be saved on the expense portion of your premiums for, in most cases, you can hardly handle your own risk as economically as an insurance company can. The biggest saving is available for those firms whose managements are so actively interested in fire and accident prevention that the losses will run less than the average for that class of industry. Look to your safety work rather than to the overhead, therefore, to determine whether you can insure yourself profitably.

From the foregoing paragraphs one should not conclude that only the industrial giants are interested in this subject. We know several fairly small concerns that have gone in for it. If you have a comparatively small business and you are satisfied that you can keep your losses below the average through safety inspections, you can arrange for self-insurance. But your provisions must be different from those of the giant corporation. You cannot drop your insurance at once because you have no initial reserve for losses. The practical program, therefore, is to continue your insurance. At the same time deposit a sum equal to the insurance premium in a special bank account. When this reserve is big enough to cover any loss that is likely to befall you, you can safely drop your insurance. A very large firm does not need to go through this preliminary waiting period because it can average its experience every year from the outset.

Since the main object of this article is to distinguish between self-insurance and the man who is just gambling on his own risk, we should outline the requirements for "going into the insurance business yourself." The very first consideration, to which allusion has already been made, is that you must own a number of units of the same kind. Insurance is a means for distributing the financial burden of accidents. It works only where there are enough units to strike an average of losses.

As a corollary to this need for division into units, it follows that you must not have any very large units. It would not be safe to undertake self-insurance on fifty branch plants and include a main plant which is so large that its loss would wipe out your business. It is axiomatic among buyers of insurance that you can leave uninsured only those risks which you can stand without embarrassment to your surplus account. A very common practice among corporations that operate several branches is to maintain a self-insurance schedule for the branches and to buy regular insurance on any big section where the values are concentrated. In this way the corporation saves as much as it can on the branches without running the risk of bankruptcy through loss of the main plant.

It takes money to run a self-insurance plan. You must have capital to start with because losses do not fall evenly over a year. It might be your bad luck to have a string of losses at the outset of your plan. For that reason you must have special insurance funds and must not use the general cash of your firm. As we have pointed out above, these funds are acquired by a big firm through merely setting aside the equivalent of the insurance premium, and by a middle-sized firm through building up a reserve over a period of years. The handling of this money should be given constant thought. It should be invested in the same type of securities that are bought by insurance companies themselves, principally government and railroad bonds, since safety and marketability are the main needs. Under no circumstances should the insurance reserve be invested in any phase of your own business.

The proper method of maintaining the fund is to charge yourself every year the full premium of the standard insurance companies, depositing this amount in the reserve. Then, if the fund shows a profit at the end of the year, the savings can be transferred to your general surplus. There is one limitation on this, however. Every insurance premium is made up of three elements—part goes to pay ordinary claims, part goes for administrative expenses, and part is called a catastrophe item to cover those infrequent tragedies, conflagrations and explosions. Now if your losses have been less than average so that your insurance operation shows a profit, you may transfer to surplus all the profit except five per cent of the annual gross premium. This is approximately the amount allowed for unusual losses. It should be left in your reserve at the end of a "good" year because almost certainly it will be needed to meet heavy losses in some future year.

You need expert management for self-insurance. If you are carrying your workmen's compensation risk, every branch must have a man who is competent to find out whether injuries are incurred in line of duty and to follow up every case under the terms of the state law. You cannot cut corners on this local service without running afoul of the state industrial commission. Such management can be obtained either by hiring your own staff or by retaining one of the few firms of insurance brokers that are equipped for such service.

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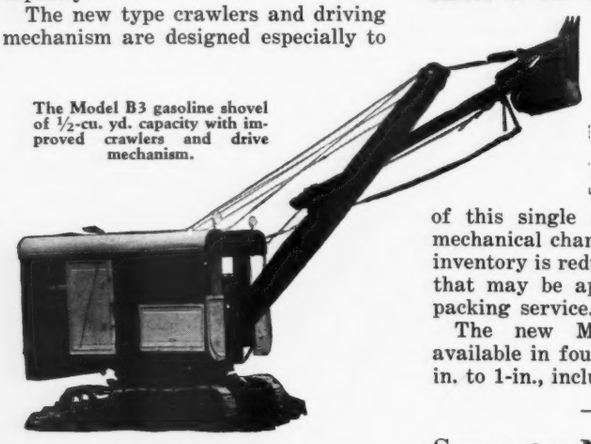
New Machinery and Supplies

Improves Crawlers and Drive on Small Shovel

The Speeder Machinery Corp., Cedar Rapids, Iowa, pioneer manufacturers of full-revolving, fully-convertible light gasoline shovels, recently announced a great improvement in the crawlers and driving mechanism of the Speeder Model B3 of ½-cu. yd. capacity.

The new type crawlers and driving mechanism are designed especially to eliminate friction and to expedite the repair and adjustment of the traction shaft while on the job. The new crawlers are of the lug-driven type, 16 in. in width, and are hinged by three eyes. A roller idler replaces the idler sprocket on the front of the crawlers. All crawler-carrier trunnions and return rollers are bronze bushed. The traction shaft is splined and no keys are used. It is supported by four heavy bronze-bushed split bearings, and is three separate shafts rather than one long shaft, as this allows the man on the job to quickly remove any part for adjustment or repair. The travel gears are machine-cut, case-hardened, and run in grease.



The Model B3 gasoline shovel of ½-cu. yd. capacity with improved crawlers and drive mechanism.

The Speeder Whirlwind of ⅜-cu. yd. capacity, the Speeder 90 of 1¼-cu. yd. capacity, and the Speeder B3 of ½-cu. yd. capacity are now equipped with crawlers and crawling mechanism of the same type.

Metal Packing Compound Produced in Coil Form

A new packing in coil form has recently been announced by Metalastic, Inc., Union City, N. J.

The fundamental base of the packing is a metal which resists corrosion from acids, alkalis, and electrolysis. This metal withstands temperature in excess of 1,200 deg. F. It furthermore possesses the peculiar and desirable property of expansion upon cooling. This metal is present in the form of a powder which thoroughly coats the fibrous asbestos particles with an unbroken metallic covering, and presents a metal-to-metal contact, resembling a bearing. These metal-covered fibres are thoroughly lubricated and bonded together under pressure, forming a homogeneous packing.

The packing compound is then formed into continuous lengths of whatever sizes are required. In this manner a single-unit packing is presented to the engineer in coil form suitable for any service condition—any fluid, any gas, any pressure, any temperature.

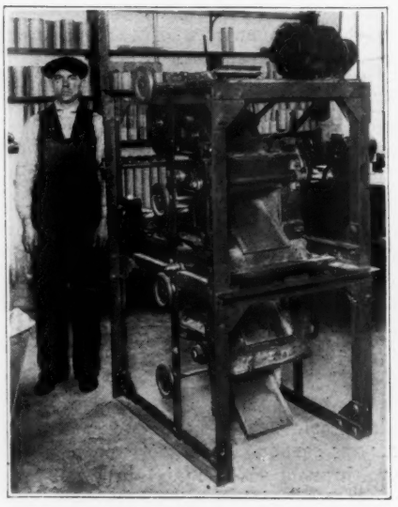
Any device, regardless of the conditions of operation, is adapted to the use of this single unit packing without mechanical changes of any kind. The inventory is reduced to one single item that may be applied to any type of packing service.

The new Metalastic packing is available in fourteen sizes from 3/16-in. to 1-in., inclusive.

Separates Non-Metallic Materials Magnetically

Research engineers of the Magnetic Manufacturing Co., Milwaukee, have perfected an induction separator which provides efficient magnetic separation of so-called non-magnetic material and material heretofore unresponsive to the highest intensity magnetic separator of the usual type.

Its construction is such as to provide intense magnetic pull with low power input and correspondingly low current consumption. Materials such as feldspar, dolomite, gypsum rock, glass sand and abrasives, are now amenable to magnetic separation with this unit.



Induction separator for non-magnetic minerals.

The separator is flexibly arranged to provide three or more stages of magnetic separation, according to the requirements of the material to be magnetically treated. Capacity ranges to ten or more tons per hour, depending upon material being handled. The unit has no conveyor belts or material actuating pulleys—the construction being such as to provide fully automatic and continuous separation by simple feeding of material into the separator.

Although the induction principle of magnetic separation is not new, Magnetic Manufacturing Co. engineers believe this unit to be the most efficient application of the principle in a well-designed and well-constructed machine.

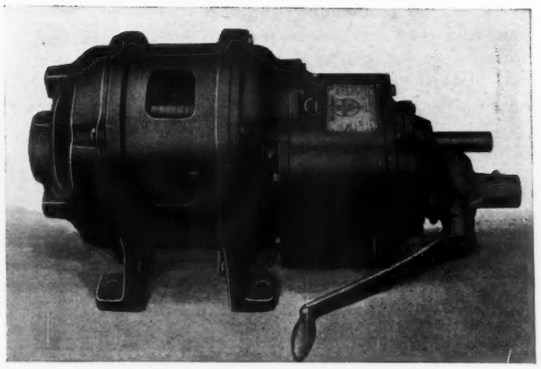
Combination Multi-Speed Motor Drive Developed

A multi-speed reduction-gear unit, built in combination with a standard a.-c. motor, has been developed by Roy T. Wise, consulting engineer, Westinghouse Electric & Manufacturing Co. Constructed to give four different speeds to the output shaft at constant horsepower, this unit, known as the Westinghouse-Wise multi-speed drive, is applicable to those many industrial operations which, for highly-efficient performance, require drives providing more than one speed. With this drive the speed of the driven apparatus may be changed instantly while the motor is running at full speed and under full load. All gears are constantly in mesh, and in no way can the operator injure the unit by changing speeds at any time.

This gear unit is mounted on a standard squirrel-cage Westinghouse induction motor. In the gear unit, a pinion mounted on the motor shaft drives a gear mounted on the countershaft. Also on the countershaft are four idling ring gears which are constantly in mesh with four gears that are pressed on the output shaft. Each of the countershaft gears is provided with an internal clutch which is made to fit the bore of the gear. The clutch is actuated by two tapered wedges which are forced between the clutch halves by a spring member. To bring this member to the correct position for a desired speed, the control handle, which is provided with a spur pinion, is rotated, actuating a rack which is mounted on the spring member. This movement brings the spring member between the tapered wedges, thereby providing the pressure for clutching any one of the four ring gears to the countershaft, which in turn drives the output shaft at the desired speed.

Between two speeds is a neutral position. To disengage the clutch and

bring it into a neutral position, it is only necessary to rotate the handle to draw the spring member into a position which does not contact the expanding wedges. A further movement of the handle brings the spring member into contact with the next set of expanding wedges, and clutches the next gear to the countershaft. Therefore, it is not only possible to make speed changes under full load, but the apparatus can be stopped or started under that condition.

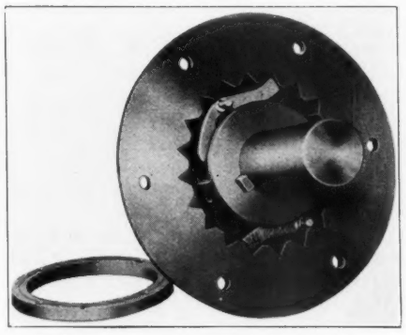


Multi-speed motor and drive unit.

Ball bearings are employed to eliminate friction in both motor and gear unit, assuring high starting efficiency and unvarying alignment of shafts. The gearing in the first reduction, or drive from the motor to the countershaft, is of the single helical type insuring quietness of operation, and the other gears on the countershaft and those on the output shaft are of the spur type. All gearing is accurately machined from high quality forged steel, and given the Westinghouse-Nuttall treatment to insure highest wear resisting and load carrying characteristics.

New "Back-Stop" Device Prevents Shaft Reversal

The Landahl life-time back stop (patent applied for) recently placed on the market by the Fairfield Engineering Co., Marion, O., provides a positive means of preventing shaft reversal. Its action is such that no impact needs to be overcome and it operates automatically, silently and instantaneously. It serves not only as an unusually efficient back stop but also as a bearing. It eliminates shaft end-thrust in either direction so that no separate set collars are required. No extra shaft space is required, as it takes the place of a standard-type bearing. It consists of two locking pawls mounted on pins held by two floating rings and a pawl collar. All these parts rotate as a unit by engagement of the pawls with the pawl collar. This pawl collar is so shaped that the pawls do not engage the ratchet as long as the shaft is traveling in the correct direction but lock in the ratchet immediately the shaft direction reverses. The collar is rigidly fastened to the shaft by both a key and a set screw. The floating rings are seated in the ratchet housing but are free to rotate with the pawls and the pawl collar.



View showing details of the "back-stop."

Wear is at a minimum as all parts are rigidly constructed, the pawls engage and disengage without rubbing the ratchet, and all working parts rotate in an oil bath. Lubrication for the housing ends (which serve as the shaft bearings) is provided by oil grooves running from the central oil bath. The housing is made in two parts bolted together and provided with paper shims. Pawls, pins and locking rings are of steel, whereas the pawl collar and housings are grey-iron castings.

These back stops are built in two styles, which can be attached to frameworks or housings by simply using longer bolts in place of the regular housing bolts.

Compression Tubing and Fittings Are Leakproof

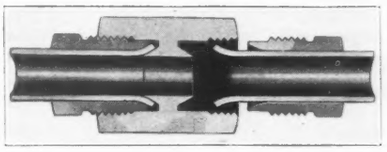
The need for leak-proof and trouble-free small service lines in the power plant and industrial field has long been felt. Recently the Bailey Meter Co., Cleveland, O., has announced that Dieform compression fittings and tubing are available for this service.

The accompanying cut is a cross-section of a Dieform tubing union. The left-hand side of the tubing union is shown with the tube in place and the tube nut screwed down tightly to complete the metal-to-metal joint, while the right-hand side shows the tube nut unscrewed and slipped back along the tubing, which in turn is removed a slight distance from the seat in the fitting. This illustration shows how the tubing is securely gripped between the seat in the center fitting and the seat on the tube nut, resulting in a perfectly tight, dry, permanent joint.

In flaring the tubing the Dieform nut serves as a die, thereby assuring a perfect seat, with the angle properly proportioned to the size of the tube. The moderate angle of flare prevents the tube from splitting or cracking and permits the use of hard-drawn tube when desirable.

Brass, monel metal or steel Dieform compression fittings and copper or steel tubing are especially well suited for piping where many bends must be made in the line and where an absolutely tight installation is required for high pressure and high temperature service. With these materials, perfectly tight metal-to-metal joints may be quickly made by an inexperienced laborer without thread compound, dies or tools other than a hammer and flaring tool. Joints made in this manner will resist vibrational strains as well as the strains resulting from the expansion and contraction of the tube caused by intermittent temperatures. Due to the reduction in the number of joints, installation of this material can be made in approximately one-half the time required for an equivalent rigid-pipe installation.

Double extra-heavy brass fittings with extra-heavy soft annealed or half-hard copper tubing are suitable for pressures which do not exceed 800



Dieform tubing union.

lb. per sq. in. and where the intermittent temperatures are under 600 deg. F. Where higher intermittent temperatures are expected, steel or monel compression fittings are recommended. Steel tubing should be used for pressures in excess of 800 lb. per sq. in. if the installation is subject to steam temperatures at intervals, although, for hydraulic lines, extra-heavy copper tubing is satisfactory for pressures up to 2,000 lb. per sq. in.

Operation of Gauge for Dredge Line Described

The Master Percentage Gauge is an instrument that indicates the proportion of solids in the stream handled by the pump of a hydraulic dredge. Its operation depends upon the specific gravity of the composite fluid—the water, the sand and the gravel. However, any instrument that could satisfactorily handle all sizes of solids that comprise the flow of a dredge would be large, unwieldy and prohibitive in cost. So the inventor of the Master gauge developed a method and a device that satisfactorily indicates the percentage of the solid content by utilizing the effect of only the particles that will pass a 5/16-in. grid. The instrument is small and compact and it gives a reliable dial indication which is of importance to the dredge operator.

The quantity of solids as indicated on the dial is the basis upon which the operator regulates his digging. The gauge will indicate instantly any abnormal pressure which is caused by

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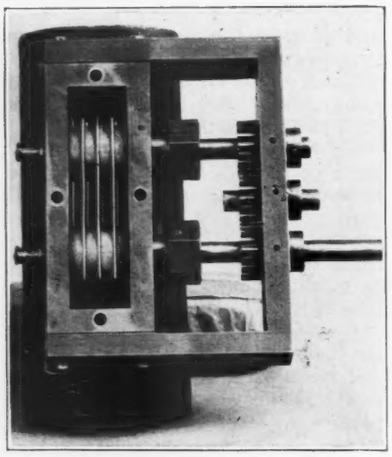


Grid which prevents oversize from entering the gauge.

too great a percentage of solids. With this device it is possible to decide upon a definite constant density which will assure the most efficient production, and it enables the operator to crowd that production with utmost safety. Immediate results in increased production may be expected if one of these instruments be installed. The increase will depend upon the skill of the operator in utilizing the information given by the instrument. All guesswork is eliminated. The operator can read the dial, which is conveniently mounted for easy observation.

The only part of the instrument that is subject to erosion by the solid materials is the screen or grid, so this part is constructed of Nitralloy, a metal having a Brinnell hardness that is 400 points higher than that of tool steel. The other metals used in the gauge are aluminum, brass, bronze, iron, steel and silver. The instrument will give years of effective service, with little maintenance expense.

The manufacturer, the Hydraulic Scale Co., Shawano, Wis., is preparing a booklet which will be ready for distribution within a few weeks. Meanwhile the company will be pleased to send descriptive circulars to all applicants.

Manganese-Steel Apron Feeder for Heavy Duty

A new, distinctive design of heavy-duty manganese steel apron feeder was Link-Belt Co.'s answer to the growing demand for a sturdier, more dependable, more durable type of apron feeder for heavy-duty service.

The new feeder is suitable for handling either abrasive or non-abrasive material containing lumps of ¼" size, and smaller, up to 6-ft. dimensions, being especially well adapted to the handling of extremely heavy, large, lumpy and abrasive materials.

The new apron feeder.

The sprockets, chains, rollers and over-lapping "non-sagging" apron pans are made of cast manganese steel, and the pans, which are ribbed, are ⅜-in. to 1½-in. thick, depending upon the service.

The chains have no small rollers (therefore there is none to lubricate), and they are placed underneath the pans at locations which break up the span of the pans. They are protected from dirt, and the stiff-back arrangement requires only a minimum of space and width for the feeder.

The broad wearing surfaces of the links of the rivetless manganese-steel chains form substantial tracks for the large manganese-steel rollers, supporting the material-carrying run. These rollers are closely spaced, and mounted on heavy through shafts turning in rugged, accessibly-located, closed-end bearings.

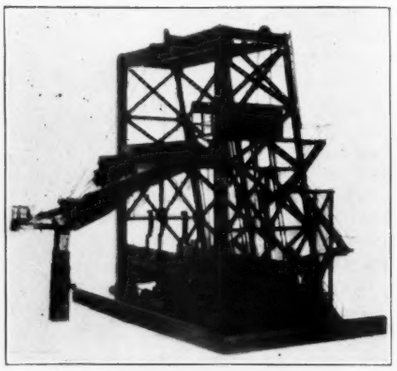
Phantom drawing showing flexing of chain as it passes around sprocket wheels.

Full details, data, and illustrations of this new apron feeder and its component parts, as well as installation views are shown in Folder No. 1251, which is being distributed by Link-Belt Co., Chicago, Ill.

Model Car Dumper Built for Exposition in Paris

The accompanying illustration shows an interesting scale model of an Industrial Brownhoist car dumper which is to be exhibited at the Portuguese display in the foreign section of the International Colonial Exposition of Paris which is to be held in the historic Bois de Vincennes in May. Complete drawings often fail to give adequate ideas to anyone but an engineer of what machines will do. A model, on the other hand, speaks all languages.

The machine selected for reproduction in model form is that known as a car-dumper, a well-known feature of the docks along the shores of the Great Lakes. The model is built to 1/50 scale. It is of the semi-working type, that is, the principal motions of the actual machine are reproduced, but the minor adjustments are not included because of the high cost of the extremely small working parts which this would involve. Even as it is, the task of making the model occupied about three months.



Scale model of the car dumper.

The model was built at the plant of the Eureka Stamping and Mfg. Co., Cleveland, O. The task demanded the greatest care, for all dimensions had to be worked out for the correct reduction from the original full-sized drawings.

Adds Line of 6-Cylinder L-Head Gasoline Engines

The Hercules Motors Corp. of Canton, O., is offering an additional line of heavy-duty, six-cylinder L-head engines designated as the JX series. This series is available in three different sizes, as follows:

Model	Bore	Stroke	Displacement
JXA	3⅜ in.	4¼ in.	228 cu. in.
JXB	3⅝ in.	4¼ in.	263 cu. in.
JXC	3¾ in.	4¼ in.	282 cu. in.

All three engines are identical in design and in installation dimensions. They differ only with respect to the bore and such parts and performance ability as are thus affected.

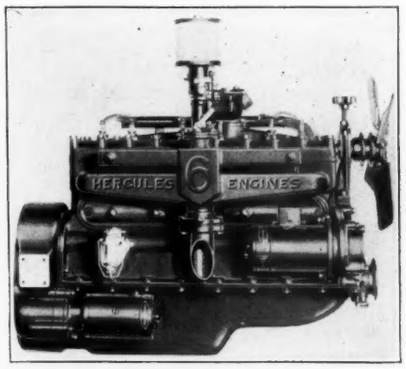
While the JX series is a strictly heavy-duty line, all sizes are designed to meet present day needs and to withstand the stresses of high speed operation. Utmost simplicity is one of the outstanding features of these models and it is believed by the builders that the engine is composed of fewer parts than any other engine of similar displacement. It is also interesting to note that the JX series six-cylinder motors are companion models to the 00 series of four-cylinder engines. Many of the parts such as the connecting rods, timing gears, valve mechanism, etc., are interchangeable. Thus in cases where either small fours or sixes may be required extensive interchangeability features are provided in the JX and 00 series.

The crankcase is cast integral with the cylinder block, assuring extreme rigidity and permanent alignment of bearings.

The crankshaft is supported by seven main bearings, all 2½ in. in diameter. The total projected area of these bearings is 27 sq. in.—a high ratio of displacement to bearing area which reduces pressure per square

inch of bearing, and combined with efficient lubrication, assures long bearing life. Cylinders are cast en bloc with detachable head. Connecting rods are drop forged. The bearing material is cast into the rod, as well as in the drop-forged caps—and the caps are held by special heat-treated bolts.

Lubrication is by gear pump of large capacity providing full pressure to all main and connecting rod bear-



New 6-cylinder engine as seen from the manifold side.

ings. The gear train is pressure lubricated through a "bleeder" from the main pressure lines. The oil pump circulates 1.4 gal. per min. at 100 r.p.m.

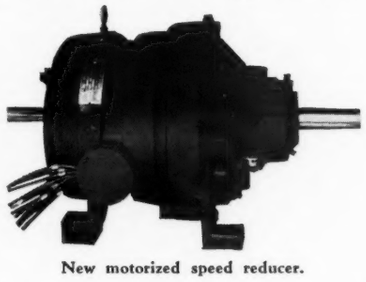
The high pressure centrifugal pump circulates a large volume of water through unrestricted passages directly to the exhaust valve area. Fan drive is arranged with V belt.

The JX sixes can be arranged for either downdraft or updraft intake manifolds. Exhaust manifolds of either center or rear outlet type to best meet the installation requirements are also optional.

Motored Speed Reducer Serves Double Purpose

The Production Equipment Co., Cleveland, O., announces that any of the motorized speed reducers that it manufactures can be supplied with shafts extended at both ends of unit.

For many applications this is particularly desirable. The motorized speed reducer consists of standard or special characteristic polyphase induc-



New motorized speed reducer.

tion motors, mounted integral with spur, helical, planetary or bevel gears retained in an oil-tight housing. As shown in the accompanying illustration the low-speed shaft, from the speed-reducer end provides a speed as low as 20 r.p.m. or may be supplied with a speed of as high as 875 r.p.m. The opposite shaft, direct from the motor, provides the ordinary standard polyphase-motor speeds of 1,800,1,200, 900 or 720 r.p.m. For certain applications the unit can be supplied with speed reducers at both ends thereby giving opposite shaft speeds alike or different from each other.

The manufacturers will gladly supply full information about these units to any one interested.

New Truck-Mounted Unit Mixes, Agitates Concrete

After years of research and development the Blaw-Knox Co. has placed on the market a truck-mixing unit which is not only designed for mixing but can be used as a closed-type agitating body for conveying pre-mixed concrete.

The Trukmixer, as it is called, is featured for the production of high-grade concrete mixes. The control of concrete mixing is removed entirely from the truck driver and automatic functioning of mixing, water control and discharge is provided.

The mixing drum is octagonal in shape, tapered on both ends and automatically reverses rotation during mixing, thus giving a true end to

New truck-mixing unit which may be used either as a mixer or to agitate pre-mixed concrete.

end mixing action. The blades within the drum are designed for most efficient mixing within a given time. These blades consist of flat steel plates, properly shaped and attached to the inside face of the drum. They are easily removed and replaced as units in short sections without having to rebuild the entire blade system. The octagonal shape of the Trukmixer drum helps the mixing action because with a series of sides and vertexes the concrete is lifted and displaced many times more than it is in a drum which is cylindrical in shape.

The measurement of water is entirely removed from the control of the truck driver. A forced-feed automatic water supply system is used which can be set for the amount of free water to be deposited into the batch of concrete, and no more water can be placed in the batch than is actually specified. The water control is equally accurate, regardless of the position of the truck body at the time when the water supply is turned on. The water is distributed within the drum through a distributing pipe of large diameter, having four points of distribution; all sprays being amply protected from clogging. The distribution of water within the drum is also adjustable.

The water-supply tanks on the Trukmixer are carried beneath the chassis, which helps to lower the center of gravity of the entire unit, increases the life of the outfit and helps the rigidity of both truck and mixing body.

The discharge door is of the screw type which lends itself more easily to the control of the discharge. In the discharge of the concrete the operator controls the action of the drum from the discharge end, and the discharge is rapid and positive without pulsation.

Blaw-Knox Trukmixers are made in capacities of 2, 3, 4 and 5 cu. yd. for mixing, and from 2 to 8 cu. yd. for agitating pre-mixed concrete.

Valve-Bag Makers Have New Factory in Seattle

The Bates Valve Bag Corp., a division of the St. Regis Paper Co. of New York, has practically completed the erection of an $80,000 plant at Seattle, Wash. The plant will have a capacity of 150,000 paper valve-bags for packing cement, lime, gypsum, etc., and will be ready for operation by May 1 of this year. The construction of the factory has been under the direction of The Austin Co.

Acquires License Rights to Preformed Wire Rope

The American Chain Co., Inc. in its annual report to its stockholders, has announced that one of its subsidiaries, the American Cable Co., has concluded negotiations with the American Steel & Wire Co., a subsidiary of U. S. Steel Corp., to manufacture preformed wire rope under a license agreement, the patents covering this material being owned by the American Cable Co.

In addition the company has concluded license contracts for the manufacture of this material with the General Cable Co.; five leading rope manufacturers in Canada; British Ropes, Ltd., and its various subsidiaries, the largest manufacturers of wire rope in the United Kingdom, together with four other companies in Great Britain; Australian Wire Rope Works, Ltd.; and Felten & Guilleaume, the largest producers of these products in Germany and continental Europe. Negotiations are also pending for similar contracts with other wire rope manufacturers.

The Owen Bucket Co., Cleveland, O., has opened a new eastern district office at Room 718, 51 E. 42d St., New York, N. Y. This is distinct from the company's office at 36-25 22d St., Long Island City, N. Y., which will continue to handle the sales and service for New York City proper.

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Legal Information for Operators

When a Mechanic's Lien Can Attach Real Estate

Generally speaking, the title of the owner of land can not be subjected to liens for material furnished or labor done in its improvement, unless it expressly or impliedly consents to the contract under which the improvements are made.

When, however, the mortgagor has in some way consented to the improvement of real estate by his mortgagee, or has expressly or impliedly authorized it, or has coöperated with the latter in plans for the improvements, or has been active and instrumental in having the improvements made, such liens will attach to the property.

For example, in Williams v. Brewton, 152 S. E. 441, it was disclosed that the owner of property mortgaged the same and later consented that the holder of the mortgage should build improvements thereon.

Subsequent litigation involved the validity of a material man's lien on the property. In holding the lien valid, the Court said:

"The liens of laborers and material men do not rest upon contract, but upon the law which gives to laborers and material men liens for labor performed and material furnished in the improvement of real estate."

Single Insurance Policy Protects All Employees

It has been held by various Courts that an employer must obtain a separate compensation insurance policy, against injuries to employees, for each business operated. However, a single policy is sufficient for a single business having several departments.

For illustration, in Phalen, 171 N. E. 438, it was shown that a man named Cashman was engaged in the business of dealing in sand and gravel and other building materials. His place of business was situated in a city and he owned a gravel pit about three miles outside the corporation limits. Sand and gravel taken from the pit were sold to different persons for use in construction work.

While operating some hoisting machinery in the gravel pit an employee's right arm was caught by a wire cable causing an injury which necessitated amputation of the arm. The lower Court held that the policy issued to Cashman covered the employees whether working in the gravel pit or at the city plant, and that operating the machinery in the gravel pit and selling the stone and gravel were incidental to and part of his business. The insurance company appealed to the higher Court and offered the testimony of its inspector of risks showing that the latter visited the place of business and that he found the premises were utilized as a storage place for builders' supplies, but that he was not informed that Cashman operated a gravel pit. The insurance company also offered testimony to prove that, in the classification of risks, a gravel pit would come under a different classification from that given to the company in the policy, and that a gravel pit with a stone crusher is a more hazardous risk than the operations declared in the policy. Notwithstanding these arguments the higher Court held the insurance company liable, saying:

"If the claimant (Cashman) was covered by the policy, it was not material whether the insurer, had it known of the operation of the gravel pit, would have charged a higher premium or assigned a different classification in the policy. . . . The operation of the gravel pit and the dealing in building materials on the premises were substantially one business. There was a close and mutually dependent connection between the two operations both in nature and in management. It follows that the injury to the claimant was one covered by the policy."

Credits Wrong Account; Court Orders Re-Credit

Considerable litigation has arisen from time to time regarding the proper account to which a seller of building materials should credit money paid by a contractor, where the latter has several accounts on the books of the material man. The recent case of Standard Co. v. Duval Co., 126 So. 643, clearly explains this duty.

In this case a contractor received money from an owner and paid it to a material man who was informed from whom the contractor received the money. The material man failed to credit this money to the account of the contractor for materials purchased for the owner from whom the money was received.

Later, litigation developed over the payment and the higher Court held the material man bound to re-credit the contractor's account, stating the following important law:

"All moneys paid by an owner to a contractor under a construction contract and paid by the contractor to a material man to whom he is indebted for material and supplies furnished for such construction under such contract are, when the source from which the contractor has derived such money is known to the materialman, subject to an equity which requires the payment to be applied to the indebtedness for such materials furnished by the material man for that particular construction. In other words, under these conditions, if the material man holds an unpaid account against the contractor for materials furnished under a certain construction contract and the owner under that contract pays a sum of money to the contractor which the contractor, in turn, pays over to the material man, it is the duty of the material man to apply that fund, if he has knowledge of its source, to that account which will reduce the potential liability of the owner of a surety on a construction bond made by the contractor."

Court Denies Right of Dealer to Obtain Lien

An important point of the law is that, although a subcontractor furnishes a bond which guarantees payment of materials used in the construction of a building, the circumstances may be such that the bonding company is not obligated to pay for the materials used by the subcontractor.

For illustration, in Piedmont Co. v. Vance Co., 149 S. E. 858, it was shown that the owner of a lot leased it to a corporation for 40 years. The corporation contracted to erect a building on the lot. One of the subcontractors, who furnished a bond, abandoned his contract and a material dealer sued the principal contractor and the corporation to recover the value of the material used by the subcontractor in the construction of the building.

It is interesting to observe that, in view of the fact that the cost of completing the subcontract, after the subcontractor had abandoned the job, exceeded the balance due on the subcontract, the Court held the material dealer not entitled to a lien on the building, saying:

"The policy of the lien law is to protect subcontractors and laborers against loss for labor done and materials furnished in building, repairing, or altering any house or other improvement on real estate, to the extent of the balance due the original contractor at the time of notice to the owner of claims therefor; but it is not provided that the owner shall be liable in excess of the contract price, unless he continues to pay after notice of claim from the subcontractor or laborer, and then only to the extent of such payments after notice. The corporation had the right under the terms of the contract to retain 15 per cent of the contract price until the completion of the work; and if the cost of completing the work exceeded the unpaid part of the contract price, there was no amount due the contractor, in contemplation of law, out of which the plaintiff's (material man's) claim should be paid, at the time its notice was given."

Proper Work Clothing—Its Importance in the Plant Safety Program

BY W. DEAN KEEFER
National Safety Council, Chicago

AN analysis of your plant accidents for the past year doubtless would show that some could have been prevented through the use of more appropriate and protective clothing. For this reason we are suggesting that you devote your May safety meeting chiefly to a discussion of the hazards from improper clothing and the value of protective clothing.

The chairman of this meeting should arrange with one or more members of the committee or possibly with a salesman who is selling protective clothing to lead the discussion. If, for any reason, this plan should seem undesirable, the plant doctor might be requested to discuss proper clothing in its relation to health. This program might be supplemented by a report on plant accidents which were known to have been related to improper clothing or lack of protective clothing.

A discussion of safe clothing should include such items as:

Shoes,
Leggings and aprons,
Hats and caps,
Gloves,
Overalls,
Other items, such as finger rings and neckties.

If the plant doctor should speak he should mention such matters as:

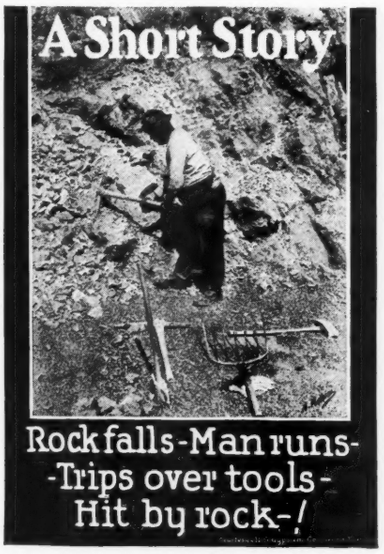
Proper dress in relation to work,
Why ample protection is necessary, and
Results of exposure.

A foreman should be previously selected to make a short talk on the hazards from loose clothing and gloves worn near moving machinery or where there is danger from flying particles of hot material.

If the men of the plant are not in the habit of wearing safety shoes, in kinds of work where there is hazard from falling material, safety shoes might be displayed at the meeting and their merit demonstrated. Likewise, the value of leggings and aprons, in the saving of clothing and in the prevention of accidents, might be demonstrated.

In quarries, pits and mines, many accidents have been prevented through the use of hats, caps or helmets as a protection against falling materials. In a report by the U. S. Bureau of Mines, it was stated that, for a recent ten-year period, nearly 50 per cent of all injuries in mines were from falls of rocks and coal, and more than 50 per cent of all fatalities underground were from the same cause. This protective equipment also might be demonstrated at the meeting.

The chairman of the meeting may gain special advance information through writing to the National Safety Council for a free copy of the safe



practices pamphlet, "Protective Clothing."

After the talks and reports and the possible demonstrations, the meeting should be open for a general discussion. Following the discussion, the chairman may find it advisable to appoint a sub-committee for the safety inspection of the clothing of all workers and especially of those engaged in the most hazardous work of the plant. There should be no resentment on the part of the workers against such an inspection, if they are made to understand that the inspection is only for the purpose of correcting unsafe conditions and the prevention of possible serious injuries.

As a summary of the meeting, the chairman might remind those who may be considering the recommendation of protective clothing that the following four principles should be kept in mind:

(a) The garment must be reasonably comfortable in any temperature in which it must be worn.

(b) It must fit fairly well and not interfere with the movements of the worker.

(c) It must afford adequate protection against the hazard for which it was designed.

(d) It must be durable.

In a modern industrial plant, the question of proper protective clothing for the worker is one of the most important phases of the safety program.

Review of Recent Books

GEOLOGIC STRUCTURES. *Bailey Willis and Robin Willis, Stanford University.* 518 pages, profusely illustrated. McGraw-Hill Book Co., Inc., New York, N. Y. The authors have endeavored to cover a scientific subject "in English rather than in Geology" so that it will prove valuable to the untechnical reader as well as to the student. The book describes geologic structures and their interpretations. Sedimentary, igneous and metamorphic processes and the mechanics of rock deformation are explained. The book comprises four sections with nineteen chapters. Its scope is restricted to the subject indicated by its title. In other words, study is given to the attitudes, shapes and arrangements of rocks rather than to their composition or economic worth. The book sells for $4.

WORLD MINERALS AND WORLD POLITICS. *C. K. Leith, chairman, Department of Geology, University of Wisconsin.* 213 pages. McGraw-Hill Book Co., Inc., New York, N. Y. In this volume, the author (who is chairman of the committee on Foreign and Domestic Mining Policy of the Mining and Metallurgical Society of America), discusses the relation of nations and continents to the productive reserve supplies and possible future developments of mineral resources, and analyzes the political significance of these factors. He discusses the world-wide tendency toward public control and the political motives which lie behind the acquisition and exploitation of minerals; and shows how these motives influence tariffs, conservation measures and the like. He considers the mineral problem in relation to the future, suggesting probable trends of economic and political policy and laying particular stress upon their significance in relation to world peace. His arguments are so unusual and convincing that the book can be read with intense interest by every person who desires to acquire broad conception of world-wide economic evolution. The price is $2, postpaid.

PIPING HANDBOOK, *by J. H. Walker and Sabin Crocker, Detroit Edison Co.* McGraw-Hill Book Co., Inc., New York, N. Y. This flexible-covered volume of 763 pages provides authoritative data for men who are intimately concerned with distributing systems around plants. The fifteen chapters comprise a library of the academic as well as the strictly practical phases of piping; from definitions, formulas and tables through properties of fluids and the metallurgy of piping materials to systems of piping for steam power, heating, water supply, fire protection, oil piping and gas piping. The book is replete with illustrations, diagrams, tables and useful data. Its price is $5.

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Fairfield Idlers are built in three types to take care of belt widths from 16″ to 60″.

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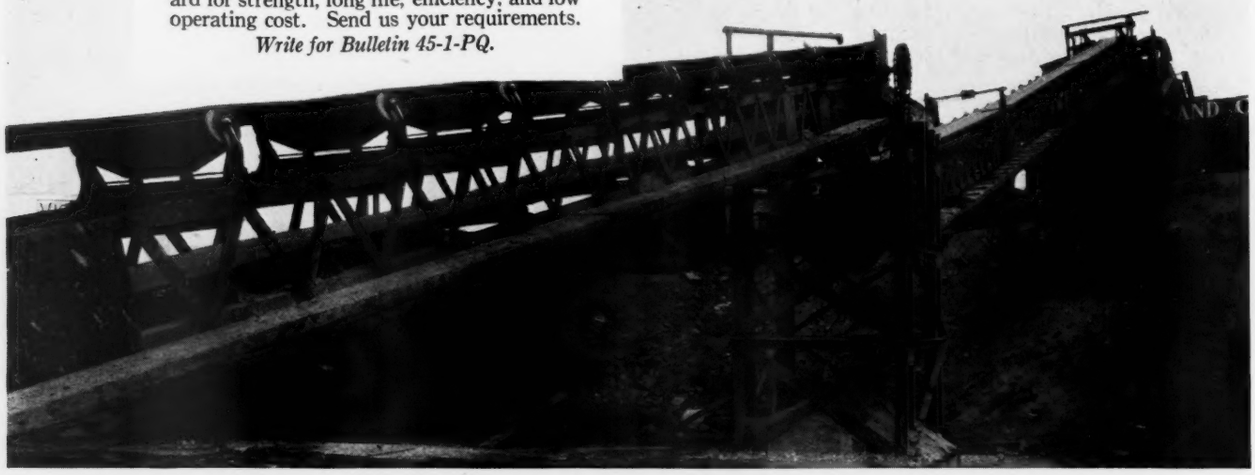

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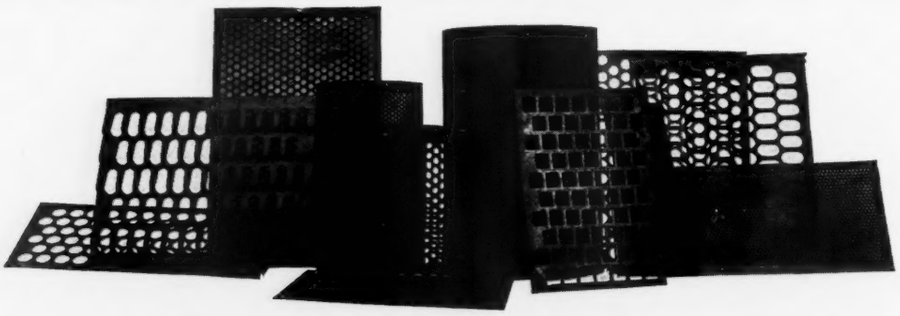

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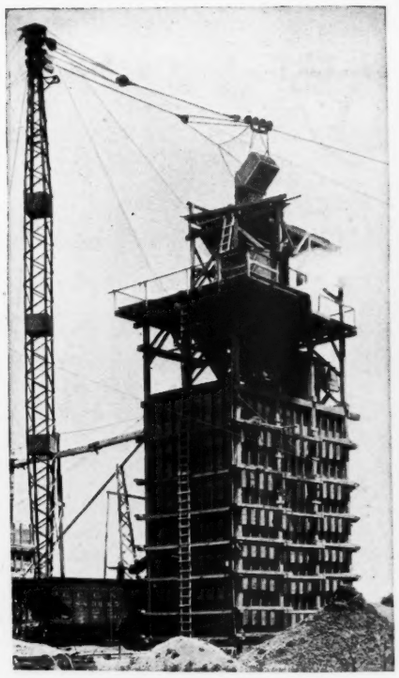

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150 ton Triple Compartment Bin and three beam Weigh Batcher.

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1½ cubic yard Drag Scraper removing Sand and Gravel from High Bank.

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You will be interested to know more about the Beaumont Electro-Auto Hoist, designed especially for Drag Scraper Service. Its exclusive features include automatic operation, remote control, automatic band clutches and brakes. Also *two speeds on Inhaul Cable* giving higher capacities and lower operating costs.

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